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DIESEL PROGRESS

February



SEPTEMBER, 1939

CIRCULATION OF THIS ISSUE—IN EXCESS OF 14,000 COPIES

25c

WATCHDOG TURNS WOLF—

Bearings eaten by the oil that should have protected them!

IN a Middle-Western city, a Diesel operator found that the modern alloy bearings in his Diesels were becoming pitted and corroded.

"Why?" asked the owner.

Investigation proved that the etching was caused by the formation of acids in the lubricating oil. The oil that should have protected the bearings was actually eating them away!

According to theories advanced to the operator, this condition was inescapable. *Any* oil would do the same. High speed, high temperature and extreme pressure were overpowering factors.

But when the oil was replaced with Shell Talpa Oil, no further etching took place!

AN ISOLATED INSTANCE? Far from it! For hundreds of Talpa-lubricated Diesels are running constantly without the slightest sign of bearing trouble.

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Shell Talpa Oil has achieved this amazing record because it is made to resist oxidation and acid formation; because it does not



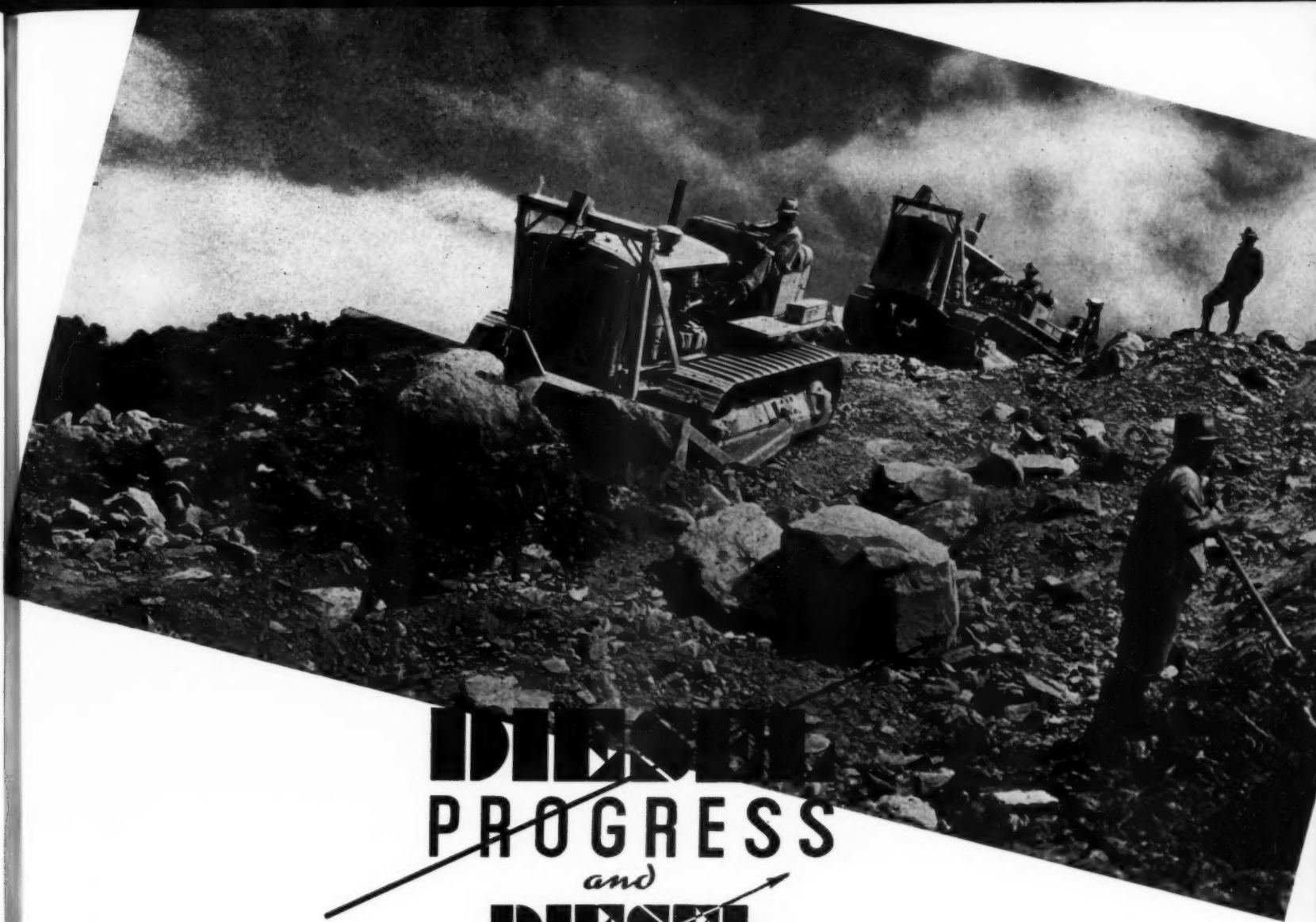
SHELL TALPA OIL PROTECTS THESE BEARING METALS:
 Hardened lead • Cadmium nickel
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break down easily; because it maintains its viscosity, provides the dependable lubrication so necessary in modern high-speed, high-pressure Diesel operation.

Call your nearest Shell office today.



SHELL TALPA OILS



DIESEL **PROGRESS** *and* **DIESEL** **AVIATION**

REX W. WADMAN
Editor and Publisher

FRONT COVER ILLUSTRATION: The *Trouper*, a very fast Diesel-engined cruiser. See details on pages 22 and 23 of this issue.

TABLE OF CONTENTS ILLUSTRATION: Nine Caterpillar Diesel 97 hp. tractors with LeTourneau carryall scrapers, bulldozers, and rippers are building 2.6 miles of new highway through Pacheco Pass in California.

DIESEL PROGRESS for September, 1939, Vol. V, No. 9. Published monthly by Diesel Engines, Inc., 2 West 45th Street, New York, N. Y. Tel. MUrray Hill 2-5092. Subscription rates: U.S.A. and Possessions, \$3.00 per year; 25c per copy. All other countries, \$5.00 per year; 50c per copy.

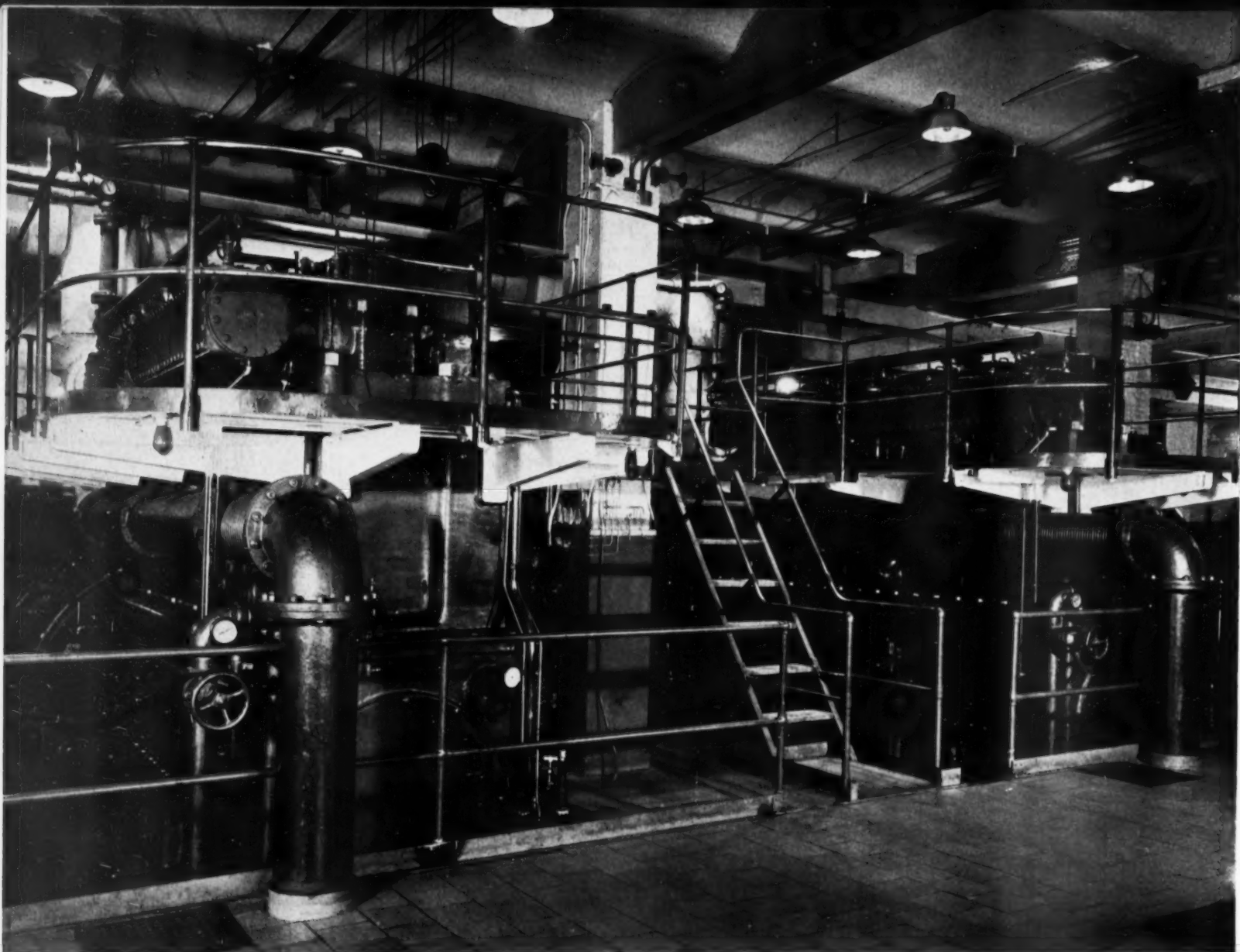
HEYWORTH CAMPBELL
Art Director

PAUL. H. WILKINSON
Aviation Editor

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Exhaust manifold side of the two 860 hp. McIntosh & Seymour Diesel engines recently installed at B. Altman & Co., Fifth Avenue, New York City. The convenient "U" shaped Cleveland Tramrail system may be seen hanging from the ceiling.

B. ALTMAN & COMPANY

By OTIS A. SIBLEY

THE installation of large Diesel generating units in the heart of Manhattan and other important business districts is now more commonplace than news. Utilization of Diesel engine economy and dependability by progressive business organizations for generation of electric power has rapidly come into prominence due to engineering refinements in Diesel design and construction as well as far-reaching advances in resilient mounting to eliminate transmission of normal operating frequencies which might otherwise disturb the public in congested districts.

The recent installation of two large Diesel generating sets by B. Altman & Company, Fifth Avenue, New York, was dictated on the basis of operating economy and made possible by correct foundation isolation. This well-known department store has generated its own power for lighting and heating requirements since the present Fifth Avenue building was first opened in 1905, using steam-driven generators for this purpose. Because of increased power demand due to the greater use of display lighting, it has been necessary to increase the plant capacity

from time to time. A steam-driven generator was added in 1913 and another in 1929. When further expansion of power facilities was contemplated in 1937, Diesel engines were seriously considered due to their economy and because the heating demand for exhaust steam was already well satisfied by the steam equipment. After a careful investigation of power and heat balance opportunities by Mr. J. A. Cummings, Chief Engineer of B. Altman & Company, Diesel engines were selected and purchase was effected through Mr. J. T. McTarnahan, Sales Engineer.

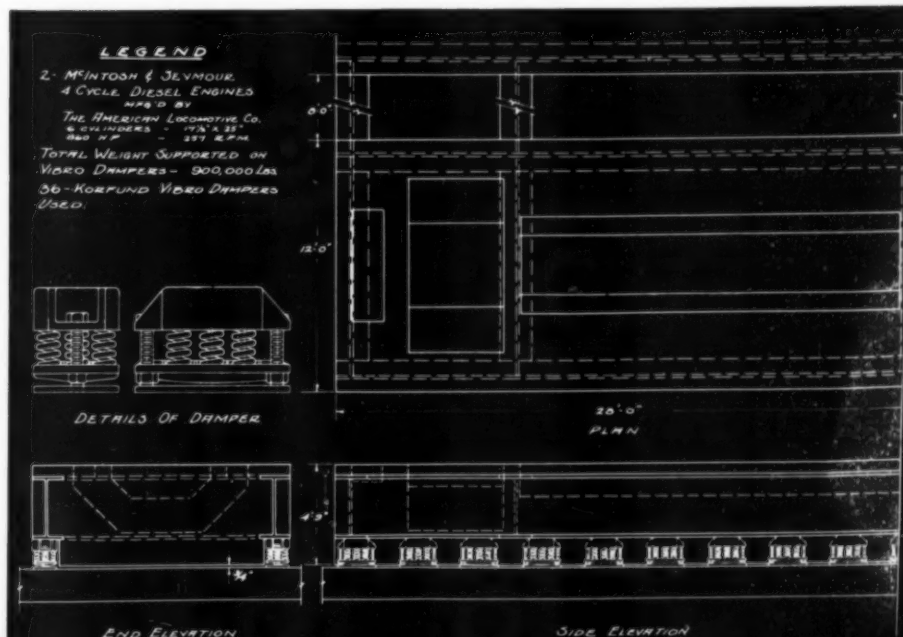
Because of the interesting engineering details involved, a general description of this plant expansion follows:

The two Diesel engines, which were first put in operation on March 23, 1938, are McIntosh & Seymour 6-cylinder, 4-cycle units rated at 860 hp. at 257 rpm. and are directly connected to Elliott direct current generators. Engine-mounted auxiliaries include Nugent fuel oil filters, Woodward governors and Manzel lubricators. Complete safety controls were installed of the well-known Minneapolis Honeywell type. Both intake and exhaust lines are fitted with Maxim silencers and, in addition, American air filters are connected to the air intake ducts. Correct balance of cylinder loading for each engine is made possible by Brown pyrometers, which provide instantaneous temperature readings for each cylinder on both engines. Other auxiliary equipment includes Viking fuel transfer pumps, a Schutte & Koerting lubricating oil cooler and a DeLaval lubricating oil centrifuge. The Westinghouse switchboard is conveniently placed for ready accessibility. To facilitate general maintenance and overhaul, a Cleveland Tramrail hoist for pulling pistons is ingeniously mounted on a U-shaped track so that one hoist serves both engines with ample space between them for lowering pistons to floor level. Two Midget levelometers give instant fuel tank readings.

Since the engine room is more than 40 ft. below street level, the necessary foundations for the Diesels would have rested directly on bedrock if resilient supports had not been interposed to prevent transmission of vibration. With a foundation situation of this kind it would be impossible to operate any type of vertical reciprocating engine at such speed without serious annoyance to the store personnel and customers, to say nothing of the effect upon adjacent buildings. This common problem was effectively solved by the installation of special Korfund steel spring isolators of 25,000 lbs. capacity each, which support the engine foundation resiliently and effect complete vibration isolation.

The accompanying drawing shows the foundation plan for one engine. The side and end elevation shows the positions of the special Korfund Vibro-Isolators as installed. Each engine is supported on a concrete block of sufficient mass to provide necessary inertia. The two foundations are rigidly connected by steel channels, as indicated on the plan view, to form an integral sub-base for the entire Diesel installation. Thus the total weight of 900,000 lbs. is supported by 36 steel spring units which makes this one of the largest installations of

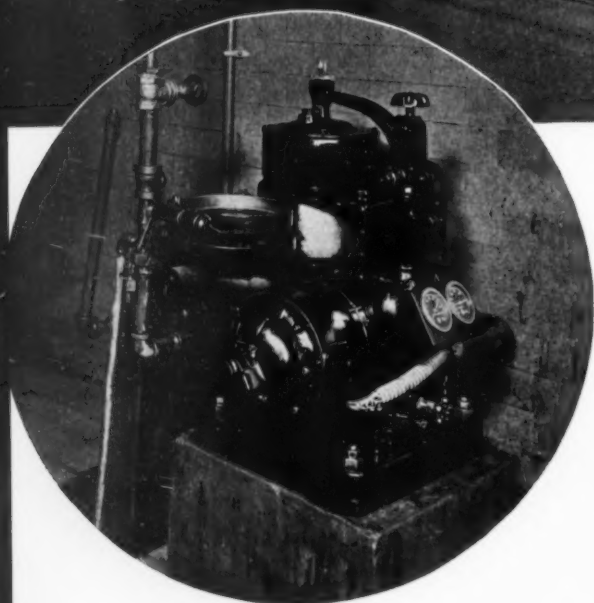
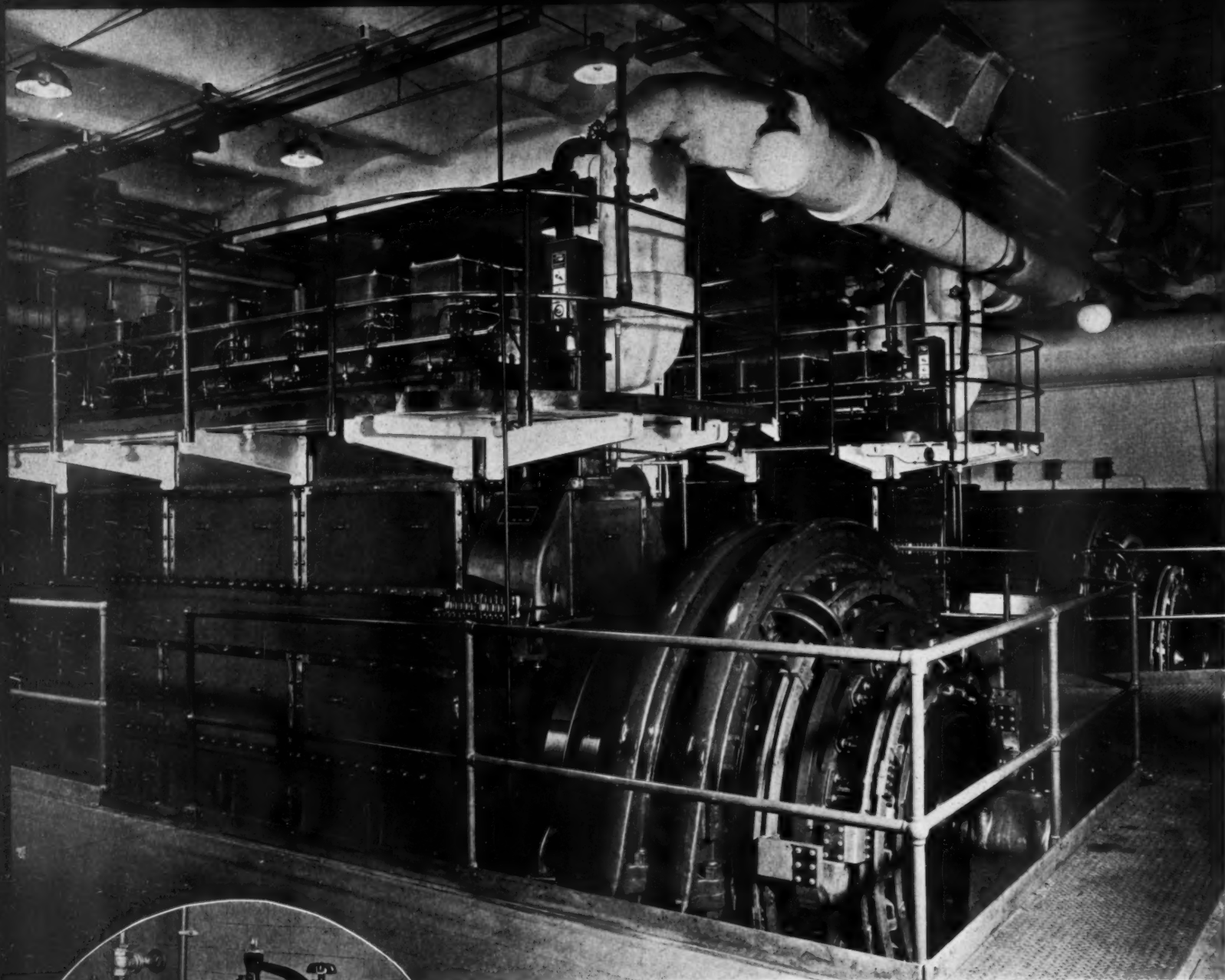
Plan and elevations of one engine foundation showing the arrangement of Korfund Vibro Dampers. The weight of both engines, generators, and foundation is 900,000 lbs., making this one of the heaviest Diesel installations ever supported by steel springs.



A familiar view to Fifth Avenue shoppers. B. Altman & Co., as seen from the Empire State Building.

this type ever installed. The isolators are easily accessible for inspection and critical adjustment at any time. It is interesting to note, however, that they have required no further attention after the initial adjustment over a year ago. Naturally, all piping connections to the engines are flexible and are supplied in this case by the United Metal Hose Company. This prevents any damping through exhaust lines, etc., and makes the isolation of the engines and generators complete.

The average power load required of the entire plant is 1,800 kw. with a maximum peak of 2,200 kw. The addition of the two Diesel engines enables the steam-driven generators to operate at approximately 80 per cent of their normal rating so that, in addition to the maximum thermal efficiency of the Diesels, their installation actually improves the efficiency of the existing steam equipment which provides a two-fold increase in operating economy. During the past year, the new engines have been



DeLaval lubricating oil centrifuge.

In the top view the two 600 kw. Elliott generators appear prominently in the foreground, and directly above them may be seen the Woodward governor on each engine.

operating on test under actual service conditions. Because of the increased reliability which they indicate, it is now possible to add more motor-driven equipment with its attendant saving and convenience. It is obvious to the most casual observer that the power and heating load demands can now be distributed among the several steam and Diesel generating units most economically depending upon the season. During the cold winter months when there is a demand for approximately 1,000 boiler hp. for heating, the steam units can be used most effectively without loss of exhaust steam. Conversely, in the summer time, the Diesels carry the base load most economically. It is unnecessary to detail the advantages of such flexibility in power generation. This is but one of many instances where the addition of Diesel generating units to an existing steam power plant has resulted in an in-

crease of efficiency considerably above the actual saving and efficiency of the individual Diesels. While this can be evaluated in dollars and cents on the basis of lower fuel consumption, increased reliability of the plant as a whole is more intangible but no less an important advantage to the store. Such modernization economies are now available to large power consumers regardless of location, and the remarkable advance of the Diesel engine in this country can be due only to its ability to amortize its own cost out of savings in a relatively short period of time.

To the thousands of Altman customers such a modern and efficient power plant will be no surprise since it is entirely in keeping with the spirit of this progressive store to serve the public dependably and economically in all respects.



Plymouth locomotive with Hamilton Diesel and Schneider Torque Converter in the classification yards of the B. & O. Railroad at Willard, Ohio.

EVEN THE RAILROAD MEN WERE SURPRISED!

By REX W. WADMAN

WILLARD, OHIO, July 28, 1939 — History was made here today when a group of keenly interested railroad men witnessed a practical demonstration of the first application in this country of a Hydraulic Torque Converter to a Diesel switching locomotive. In the Willard yards of the Baltimore & Ohio Railroad this afternoon, this locomotive was put through its paces and amazed all of us by its extreme flexibility.

As many as 107 empty cars were pulled up and down this classification yard for a distance of one-half mile. As many as 102 cars, including ten seventy-ton loaded cars were taken over the hump, which is about ten rail lengths long at 3% grade; 3,007 tons in 51 cars were taken over the hump at top speed allowed on the hump without even full throttle on the engine.

The performance of the locomotive on the coal tipple was probably the most unusual feat in that such a performance cannot be duplicated

by any other type of locomotive. Three loaded coal cars were placed in front of the locomotive and the car carrying the audience attending the demonstration was placed back of the locomotive. The total weight of the four cars, not including the weight of the locomotive was 296 gross tons. Starting from the bottom at practically a dead start, the locomotive took this load to the middle of the grade and stopped, and then continued to the top with the load. The amazing part of this demonstration is that this coal tipple is one-quarter mile long with a five per cent grade.

The remarkable tractive effort of this locomotive, about which many of us present seemed puzzled, can probably only be explained by the extreme smoothness with which the engine power is applied to the wheels. And so another development makes it certain we will see even wider use of Diesel engines in railroad service.

In brief, the demonstrating unit we saw here today is a seventy-ton Diesel Hydraulic drive

unit of an 0-6-0 type, 56½" gauge, having three pairs of driving wheels 42" in diameter, manufactured by the Plymouth Locomotive Works in Plymouth, Ohio, and equipped with a six-cylinder 8¼" x 12" Hamilton single acting vertical four cycle Diesel engine, rated at 400 hp. at 900 rpm. manufactured by the Hooven, Owens, Rentschler Division of General Machinery Corporation. This engine is direct-connected to a Schneider Hydraulic Torque Converter manufactured by the Hydro Transmission Corporation, Hamilton, Ohio.

This new hydraulic transmission, consisting of a special design of hydraulic torque converter and hydraulically engaged and disengaged gear sets, is a strictly American development of Heinrich and Adolf Schneider and is not manufactured under a European license.

The engine is expected to appeal to the railroads because it has been designed especially for railroad service, and years of extensive tests,

simulating railroad operating conditions, has resulted in a sturdy, rugged, accessible and efficient engine of simplified design, that will give dependable, economical service with a minimum of maintenance.

The principal accessories on the engine consist of a Nugent lube oil filter, a Maxim exhaust silencer, a Burgess intake silencer, American Hammered "Gold Seal" piston rings, Satco bearings, hollow cored alloy cast iron crankshaft machined by the Erie Forge Co., Pickering governor, Leece-Neville 1 kw. generator, Purolator fuel filter. Auxiliary equipment consists of Quincy air compressor, Exide battery, Young Radiator type oil cooler, a Modine radiator, De Laval water circulating pump, and Northern pumps for the converter pump, engine oil pump, high pressure (clutch) and fuel pump.

The successful development of such an important invention is a credit to American ingenuity and foresight.

Hydraulic torque converters of several different designs have achieved general acceptance in Europe, but the European torque converters do not fully meet the different operating requirements and conditions in this country, and that accounts for the fact that this important engineering advance has not "taken" in this country. However, the Schneider brothers, Heinrich and Adolf, who have worked with hydraulic transmissions for many years, designed a hydraulic transmission which is more simple and efficient for American operating requirements than the European designs.

Mr. George A. Rentschler, president of the General Machinery Corporation, had the foresight to see the contribution this type of drive would make to Diesel locomotive performance, and the courage to see that the development work was completed. He had brought Mr. Schneider to Hamilton to direct the Diesel Engineering of General Machinery Corporation and with Schneider Brothers, organized Hydro Transmission Corporation to manufacture the hydraulic transmissions.

In the November, 1938, issue of DIESEL PROGRESS on page 38 we briefly referred to the Schneider Hydraulic transmission and also to the six cylinder Hamilton Diesel engine. We are now in a position to give a detailed description of this remarkably successful torque converter:

The Schneider hydraulic torque converter consists essentially of three parts; (1) The centrifugal pump impeller, attached to and driven

by the Diesel engine flywheel. (2) The turbine, attached to the drive shaft of the locomotive. (3) Torque increase apparatus which does not rotate and is attached to the outside casing of the torque converter. The housing of the torque converter is bolted directly to the Diesel engine housing. There is about $\frac{1}{8}$ inch clearance between the rotating wheels and the stationary parts. These rotating wheels are carried on ball-bearings and lubricated with the converter oil.

The action of the converter is such that the power transmission through it varies with the engine speed and depends on the velocity of the oil circulation through the various bladings in the converter. Part of the oil drains from the converter back to a storage tank and is replenished by a gear pump.

The two-speed gearbox is bolted directly to the housing of the torque converter and consists of two identical and interchangeable gear sets, their positions reversed on the shafts, that is, there are two identical pinions and gears which are always in mesh. Clutching between the two is obtained through the use of hydraulic clutches consisting of plates with annular V-grooves which match a set of pistons with similar grooves. The pistons are carried in a drum which is attached to the shaft. The clutch plates form the hub of the gear. When it is desired to engage this clutch, pressure is applied to the pistons by oil supplied from a small high-pressure pump coupled directly to the torque converter pump which in turn is driven by V-belts from the main engine. When it is desired to change from high to low, or vice versa, the handle of the shifting valve is moved by the operator, going from low to neutral to high. This relieves the pressure behind one set of pistons and applies a pressure to the other set of pistons. Since the supply oil to the clutches comes through the shift valve, there is no possibility of engaging both clutches at one time. Also, due to the fact that there are no jaws to engage or gears to mesh, it is impossible to shift improperly. Due to the use of the hydraulic torque converter it is possible to start the locomotive and its load in high or low gear without causing any damage to engine or transmission.

The top speed of the locomotive in high gear and in low gear depends upon the gear ratios. The range is the same in reverse as in forward.

There are several features inherent in the Schneider hydraulic transmission that cannot be obtained with the conventional clutch and gearbox type. The hydraulic transmission provides an infinitely variable torque and speed

ratio, automatically changing according to load. Furthermore, this automatic characteristic is not obtained by special mechanical devices which provide torque and speed changes, because this is an inherent characteristic of the Schneider torque converter.

There is a definite simplicity obtained by eliminating the clutch lever and the large number of gear shifting operations. With no clutch and only two gear sets, shifting to either high or low is performed hydraulically by a small lever on a shifting valve at the operator's control stand.

Naturally simplicity in design means less maintenance and an all around more economical unit. Repairs and replacements are minimized and all work that may later be required can be effected with less time and expense because of the simplicity and accessibility. The torque converter has only two moving parts and the further advantage of running in a continual bath of oil with sufficient clearance between the revolving parts to avoid wear.

Due to the fact that there is no mechanical connection between the engine and the transmission, road shocks are not transmitted to the engine or vice versa, thereby protecting both engine and drive mechanisms. This gives smooth, shockless performance to the whole locomotive not only relieving the operator but making it impossible for the operator to abuse either the engine or transmission.

A further advantage is found in the fact that a great load can be moved because full engine power can be delivered with such smoothness at starting. The Diesel engine can be brought up to full speed to start, and the variance between the engine speed and the torque converter being smoothly taken up as the load is brought up to speed. This makes it impossible to overload the Diesel engine whether the locomotive moves or not. Since there are no mechanical connections between the engine and the wheels, nothing can be damaged when the locomotive is overloaded.

The torque converter delivers an increase in torque from maximum speed to low speed and stalling, sufficient to handle all loads for which it is designed under any operating condition. The selective two-speed gearbox, hydraulically operated, affords a further increase of the maximum torque of two to five times, enabling the locomotive to move and accelerate an extreme load.

The problem of maintenance on the hydraulic torque converter is practically eliminated due to the fact that no moving parts come in con-

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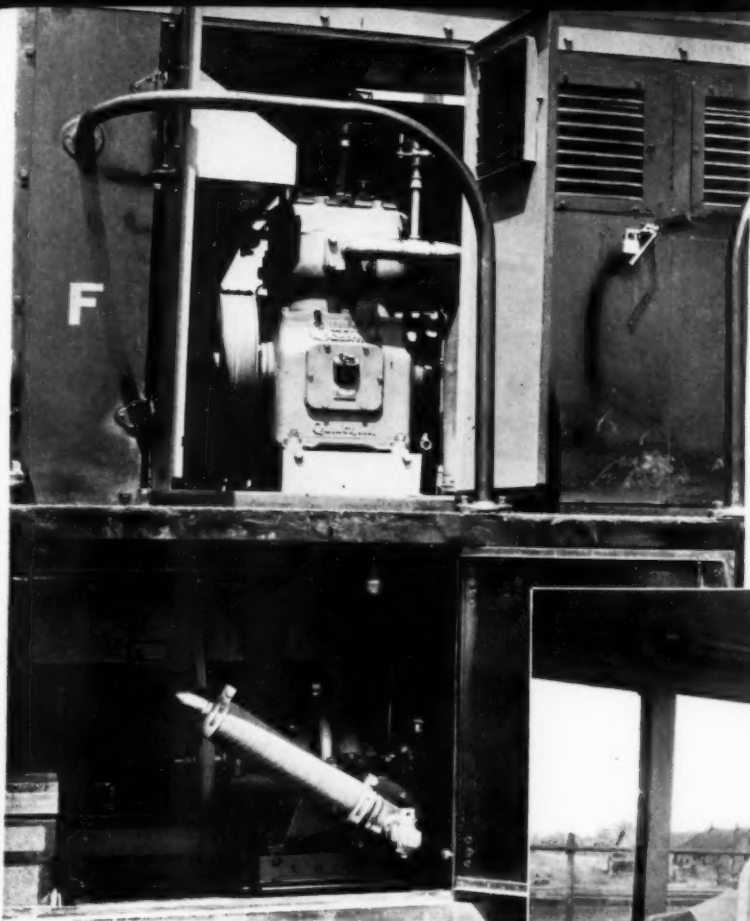
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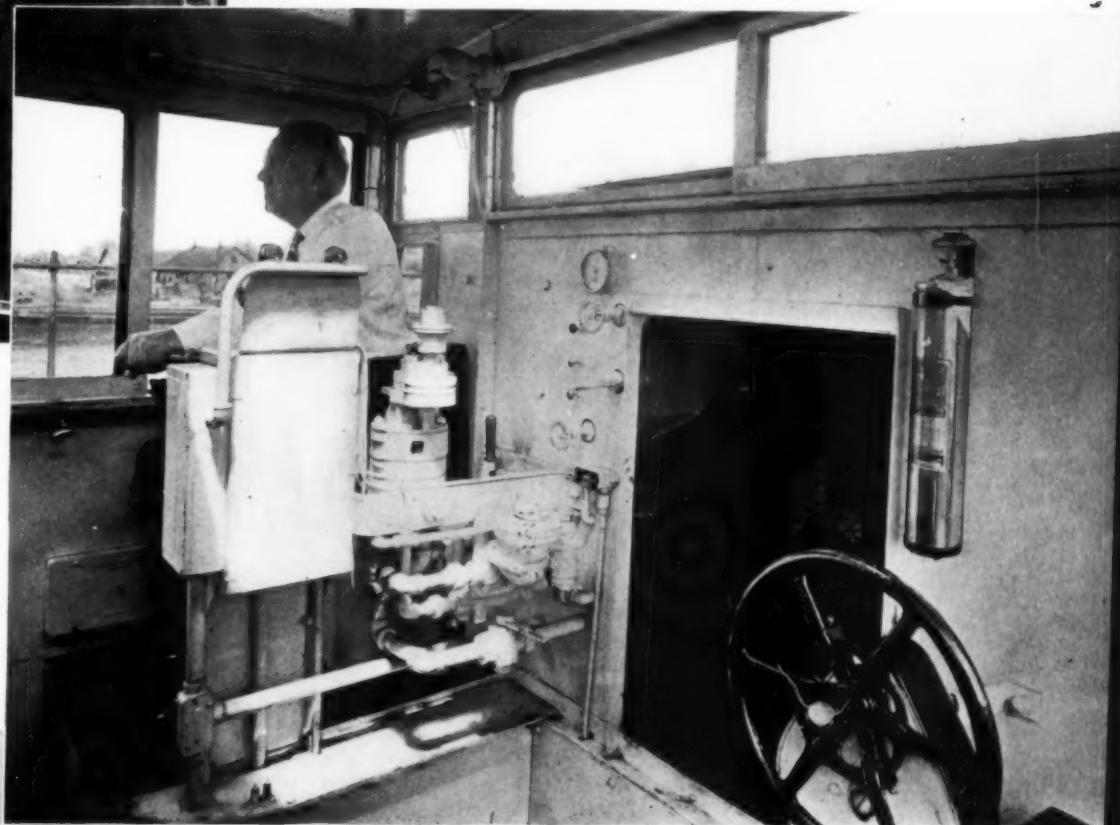
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Close-up of the Quincy air compressor direct-connected to the six cylinder 400 hp. Hamilton Diesel engine installed in the seventy-ton Plymouth locomotive. Under the compressor is located the De Laval water circulating pump and in the left-hand corner the Exide battery.

The initial trip up the coal tippie in which two loaded cars were pushed without noticeable effort. Later three loaded cars, plus the gondola, were easily pushed to the top of the tippie, up a 5% grade.

tact with each other, with the exception of the shafting and bearings, which are anti-friction bearings requiring little or no attention. The two-speed gearbox consists essentially of gears, clutches and anti-friction bearings. The gears of conservation design are well lubricated and require no attention, since alignment cannot change due to the use of anti-friction bearings. The clutch wear is negligible due to the fact that the clutches are protected by the hydraulic torque converter, most of the slip during engagement is taken up by the converter and the clutches can, therefore, be of the quick gripping type.



Your editor at "the wheel" of the seventy-ton Diesel Hydraulic locomotive during the demonstration held at Willard, Ohio, July 28th. "This locomotive handles easier than any automobile I have ever driven."



FASTEST DIESEL YACHT AFLOAT

By OTIS A. SIBLEY

TO Cooper-Bessemer goes the credit of powering the fastest Diesel yacht afloat, the largest Diesel yacht built so far this year in the United States, and the first super-charged Diesel yacht ever to be launched from an American yard. The trim vessel which recently merited these three outstanding distinctions is the *Trouper*, built by Robert Jacobs, Inc., for Mr. C. A. Tilt of Chicago. As president of the Diamond T Truck Company, Mr. Tilt is well versed in mechanical details, design, and construction and much credit is due him personally as well as to John H. Wells, Naval Archi-

tect, for the conception and execution of so fast a ship without sacrifice of comfort or seaworthiness.

Trouper's double-planked mahogany and cedar hull is thoroughly reinforced with steel to withstand the exceptional stresses imposed by her power and speed characteristics and, despite these, will undoubtedly outlast most yachts of this type in length of useful service. Principle dimensions are: Length o.a. 106'-9"; Length l.w.l. 104'-4"; Beam 18'-0" and Draft 5'-8½". There are three double staterooms with con-

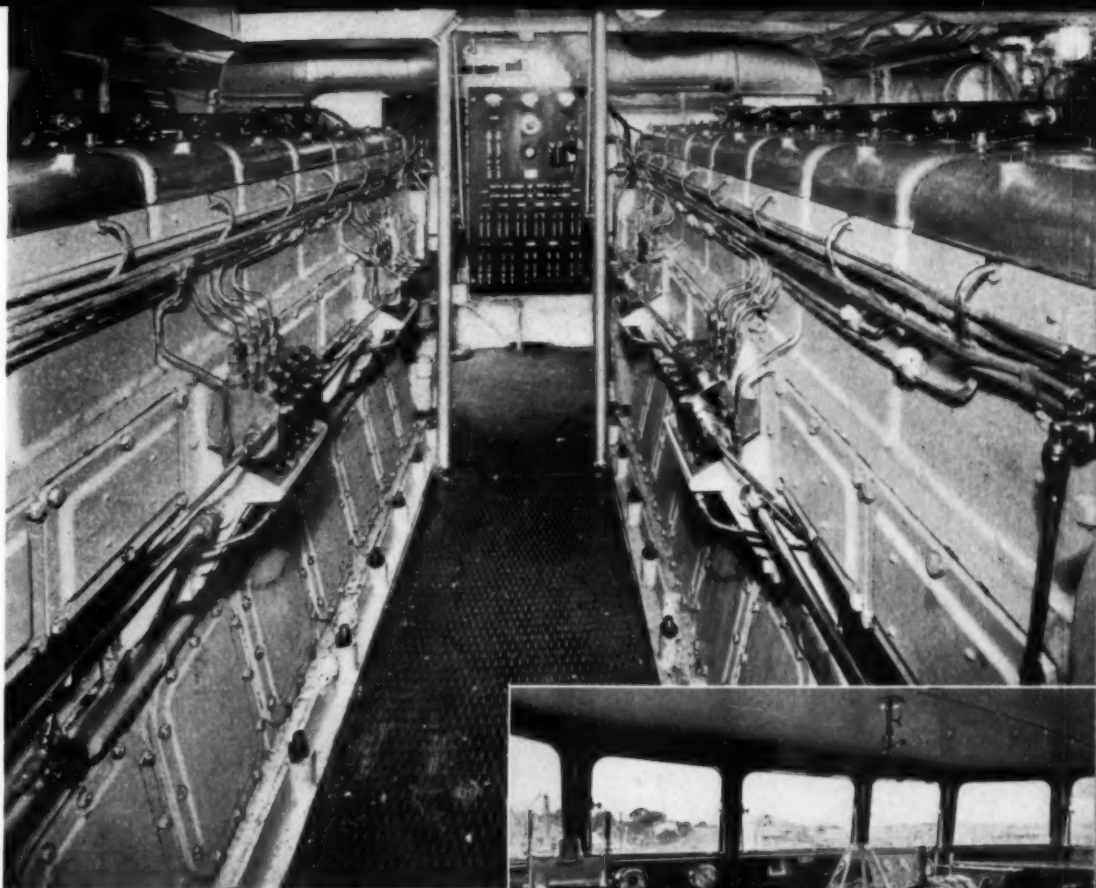
veniently located toilets, showers, and wardrobes and an exceptionally large cockpit in addition to the lounge and dining saloon to accommodate the owner and guests most comfortably. Interior decoration has been executed with remarkable taste throughout by Raphael Studios, New York.



The twin main propulsion engines are Cooper-Bessemer 8 cylinder, 4 cycle, direct-reversible Diesels fitted with Buchi super-chargers and develop 600 hp. each at 900 rpm. They are directly connected with the two propellers by Tobin Bronze shafts 4 in. in diameter and 40 ft. long. In this connection, the total absence of vibration is of particular interest. Duplicate engine controls are installed on the bridge for "pilot house operation," if desired, as are Weston electrical tachometers, one for each engine. One 16 thermo-couple Alnor pyrometer serves both units and is placed below. Other auxiliary equipment includes Purolator fuel oil filters and Zenith lubricating oil filters. Also engine-mounted are Pickering governors and Curtis air compressors. Electric power is furnished by a 10 kw. Hercules Diesel generating set with Exide batteries floating on the line. Both Johns-Manville and Burgess sound insulation has been installed and no engine room noise is audible even in the lounge which is directly above this compartment. Pneumercator gauges are fitted to fuel tanks with a

←Control stations of the main engines. The Weston electrical Tachometers appear prominently in the foreground. 16 point Alnor Pyrometer, which serves both engines, may be seen between them on the far bulkhead.

Super-charged Diesel yacht "Trouper" on her trial trip. Note the long, clean bow wave which contributes to her speed of approximately 20 miles per hour. ↓



View of engine room looking between the two 600 hp., super-charged, Cooper-Bessemer Diesels is shown at top. Directly above is view of the bridge showing the duplicate main engine controls on the starboard side and a conventional engine room telegraph on the port side.

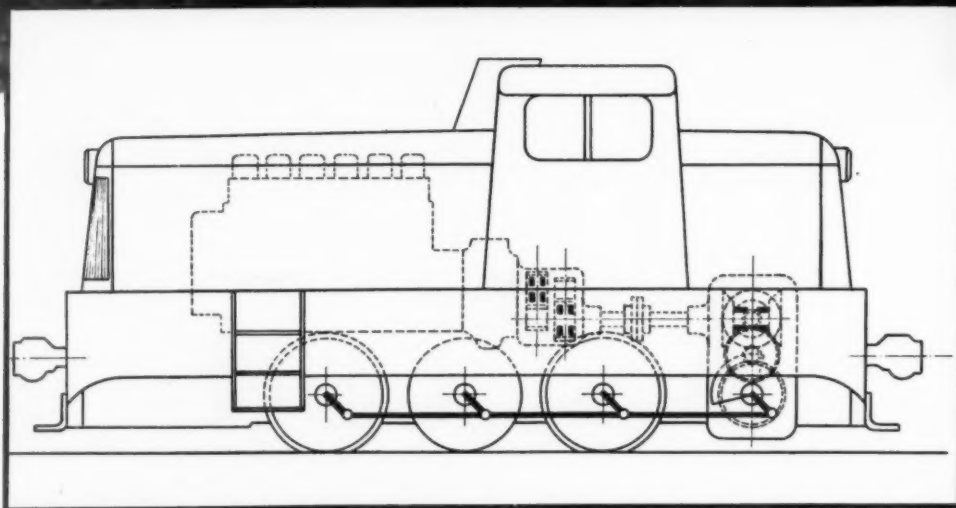
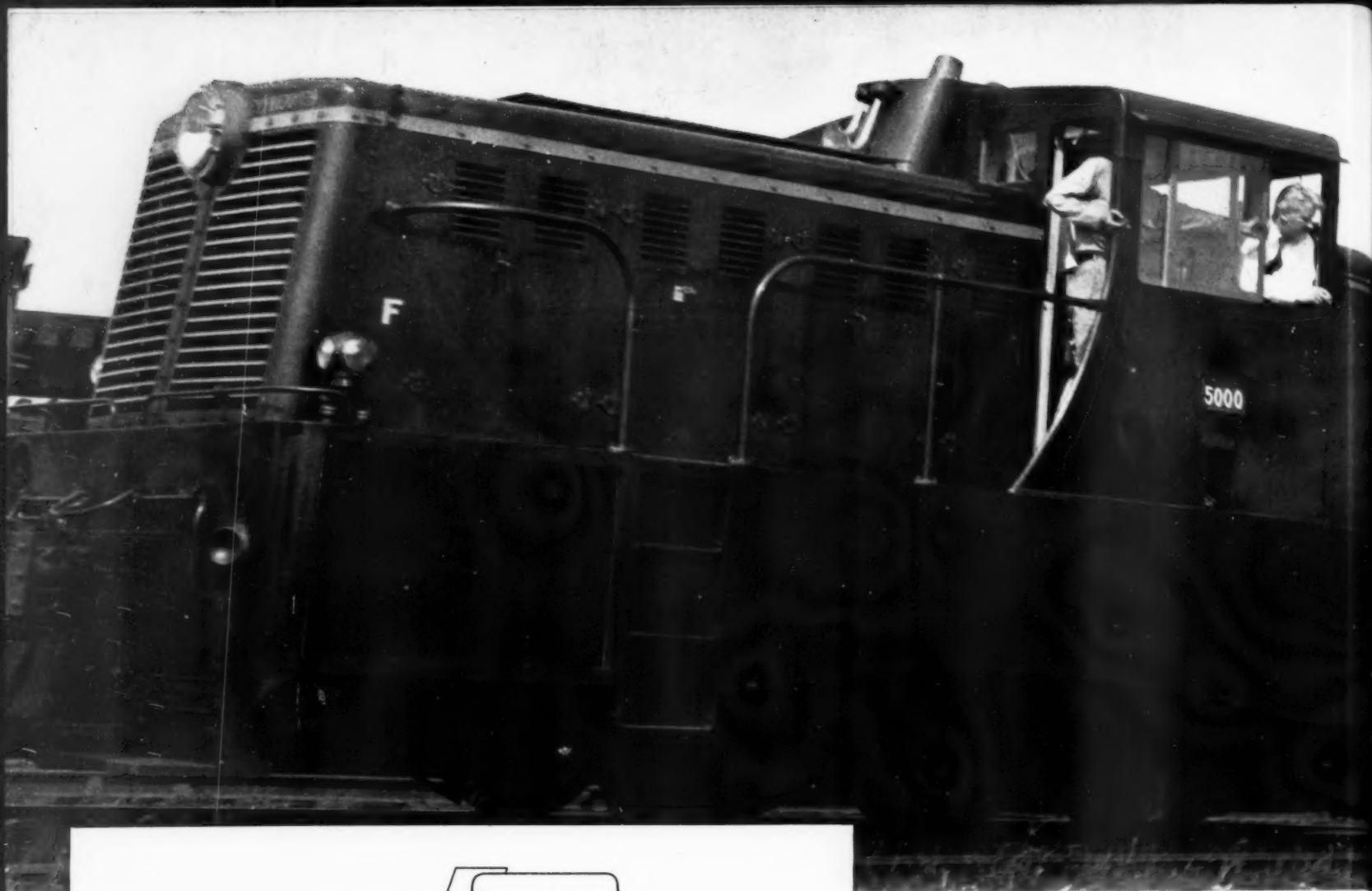
total capacity of 1,800 gallons which give the *Trouper* ample cruising range to live up to her name under all conditions.

Although New York City is her port of registry, the new yacht left for Chicago via the New York State Barge Canal immediately after trials and will spend the summer in the Great Lakes cruising. Winter plans include Florida and southern waters, where she will be one of the most outstanding additions to the pleasure fleet. Since the owner usually prefers to make port at night, the high speed of approximately twenty miles per hour will enable him to make a selection from a wide range of harbors located within one day's sailing.

A rare combination of many normally opposing qualities, *Trouper* typifies the yachtsman's dream and it is not surprising that safe, de-

pendable and economical Diesel engines were chosen for a vessel that is the last word in cruising comfort as well as mechanical excellence.





Diagrammatic sketch illustrating the general layout of this installation: Engine, transmission, and two-speed gear box. The most effective and efficient method yet devised for transmitting power to the driving wheels.

A demonstration of this 70-ton Hydraulic Switching Locomotive can be arranged. We invite opportunities to put this flexible switching unit to work in YOUR yards.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★
GENERAL MACHINERY CORPORATION

Hooven, Owens, Rentschler Division

Hamilton, Ohio

THE RAILROAD MEN WERE *astonished!*

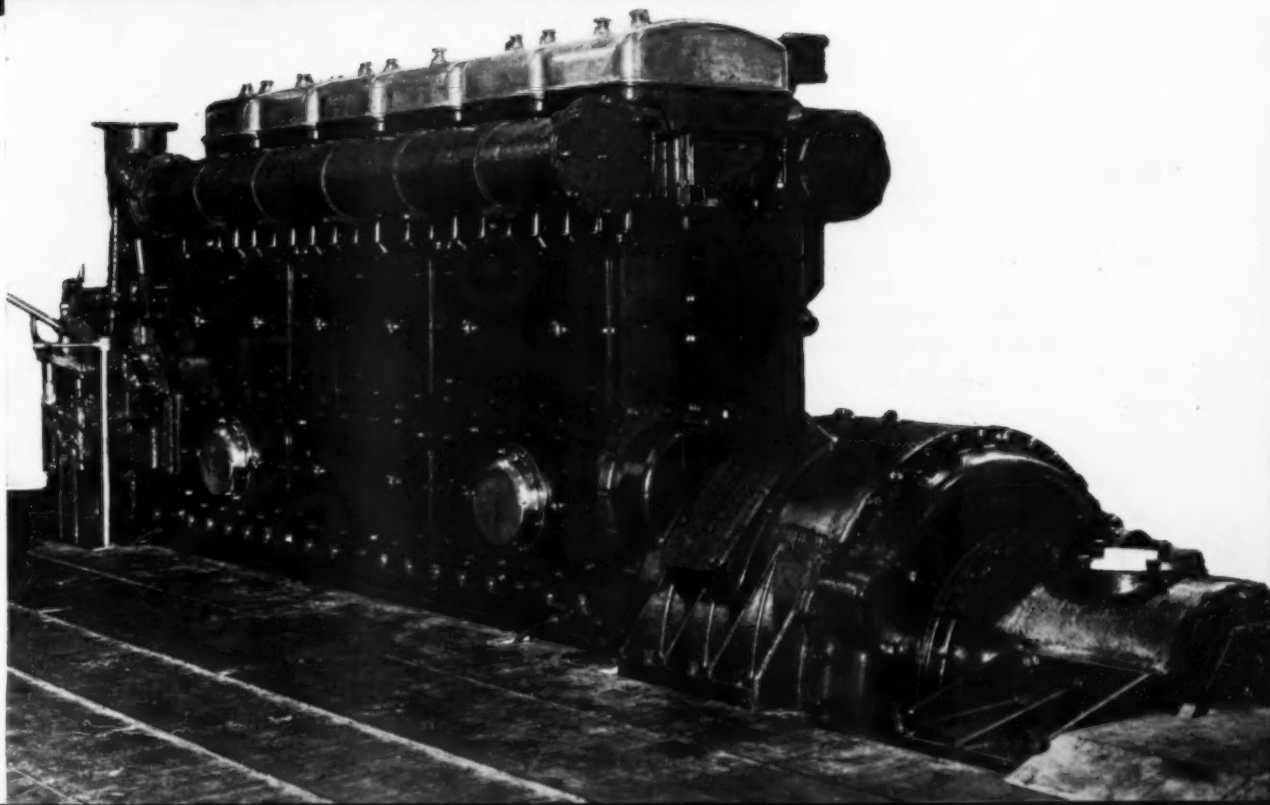
THE demonstration of this 70-ton Diesel Hydraulic Locomotive at Willard, Ohio, on July 28th, astonished a large group of railroad men who were present—and well it might. Full details of this unique and history-making application of a hydraulic transmission to a switching locomotive appear on pages 19, 20, and 21 of this issue.

This is a 70-ton Plymouth Switching Locomotive powered with a six cylinder 400 hp. Hamilton four cycle Diesel Engine direct-connected to a Schneider Hydraulic Torque Converter, manufactured by the Hydro Transmission Corporation, Hamilton, Ohio. The torque converter is bolted to the engine block and is designed to absorb and transmit full engine power at rated speed.

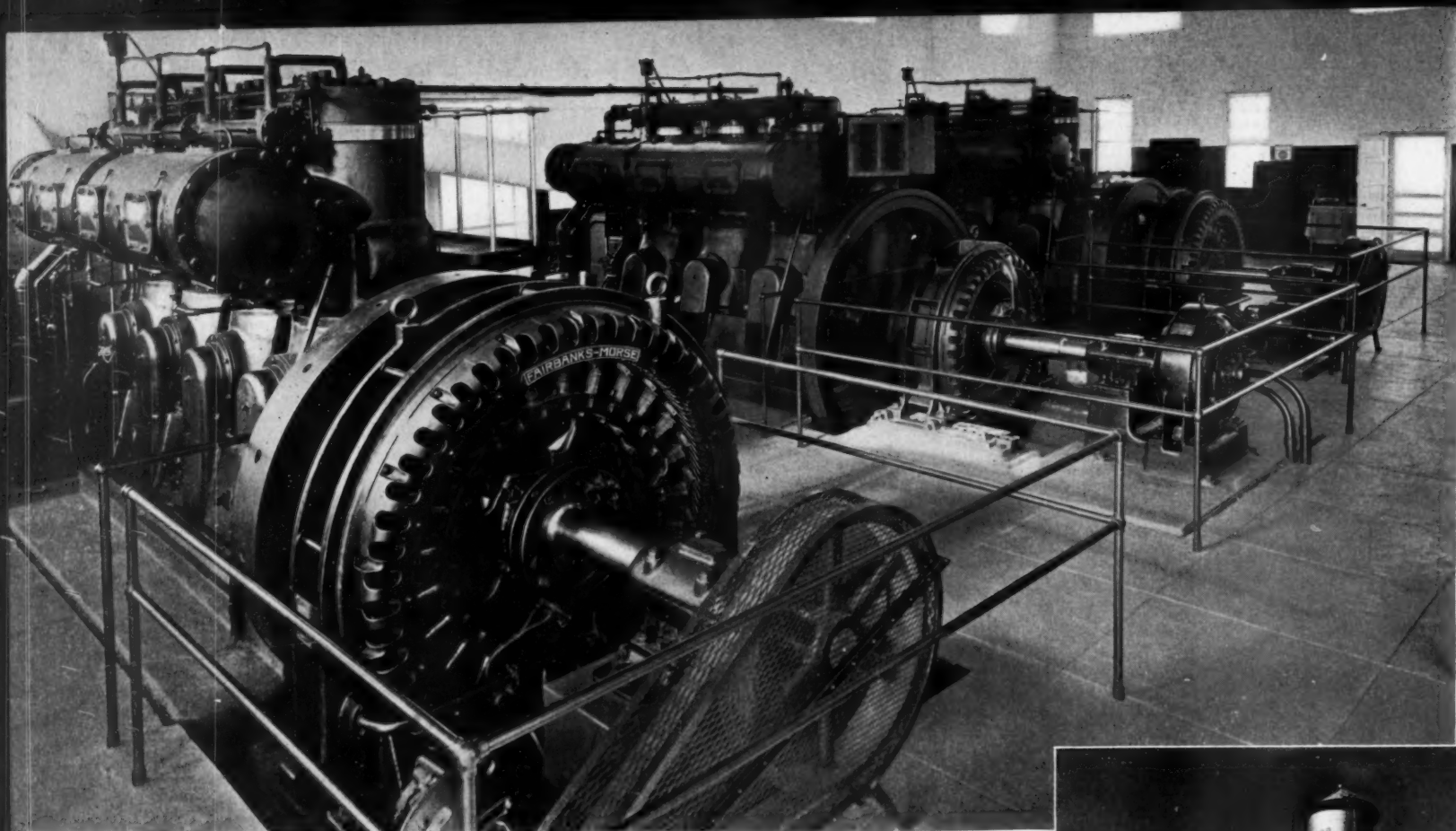


One of the most spectacular demonstrations at Willard was the manner in which this Hydraulic Locomotive pushed loaded coal cars up a five per cent grade coal tippie without noticeable effort, even stopping half way up, then starting and going the rest of the way—again without noticeable effort.

The six cylinder HAMILTON four cycle 400 hp. at 900 rpm., $8\frac{3}{4}$ " x 12". A compact, highly developed Diesel Engine from the famous Hamilton Engine Shops.



★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★
HYDRO TRANSMISSION CORPORATION
Hamilton, Ohio



General view of the Municipal Diesel Plant at Sanger, Texas, showing the three Fairbanks-Morse Diesels, details of which appear hereunder.

SANGER, TEXAS

By ORVILLE ADAMS

MUNICIPAL operation of Diesel-driven light and power plants in Texas by a score of towns having less than 1,500 in population during the last decade has shown that any good installation of this size compares favorably with results obtained by very successfully operated Diesel plants by towns and cities ten to twenty times this size. Sanger, Texas, with a population of little more than 1,200 and an installed capacity of 700 hp., ranks high in this group of small successful municipal Diesel enterprises in Texas. Starting a municipal plant more than fifteen years ago with a single natural gas engine, the present Sanger plant has grown to its present size as a natural result of the increased use of electric current and the practical experience of small town officials in supplying light and power to its citizens by means of municipal plants.

The present Diesel plant is completely modern and consists of three Fairbanks-Morse Diesel engines, an entirely new power plant building, switchboard and auxiliary equipment, including two new Diesel engines, and an overhauled engine, the installation having been completed and started operation May, 1939. The first Diesel engine installed several years ago was modernized with new pistons and cylinders, the latest type open-head, modern fuel injection system, water-cooled exhaust manifold, air filters, pyrometer, fuel filter, and adjuncts to modernized operation, which resulted in making this engine similar in most respects to the new engines.

A year or so ago, the town officials started to modernize the plant and planned to install the new equipment. The plans made included an



Exterior of the Sanger Texas, Municipal Diesel Plant.

application filed for a PWA grant to cover approximately 45 per cent of the total costs. A small local opposition to this undertaking was heavily augmented by the usual outside and uninvited interference and pressure, with the result that the officials and citizens encountered considerable difficulty in passing the necessary municipal legislation authorizing the modernization program and the issuance of the bonds required to cover the town's share of the costs. Despite the outside pressure and efforts to thwart the will of the people, the citizens voted to authorize revenue bonds and approved the entire program as recommended by the engi-

neers. These revenue bonds are not tax supported and secured, but are to be paid solely out of the net revenue of the municipal plant. Consequently the project can never become a tax burden on the people.

On the other hand, the program really resulted in a decided tax relief and a guarantee against heavy taxation. Prior to the modernization program and plans to build the new plant, an election to authorize the sale of the municipal plant at what appeared to be an attractive figure offered by the power company was held, but the people turned down this proposition in the face of the fact that a well-organized campaign of propaganda which had been started to force the election. The citizens, however, obtained the facts straight from experience; for example, in 1938 the city collected approximately \$22,771.00 in revenue from the municipal operation, out of which they paid operating expenses and turned into the city general fund more than \$4,000.00. In addition to this, the light plant furnished the people of the city with \$1,200.00 worth of free street lighting and other services, and another \$1,200 worth of free water and fire plug service for fire protection, making a total for the light and water services of \$6,474.00 as a direct money benefit to the city, which would have required taxation. During this period of time the town collected in taxes only \$2,434.00. It naturally follows that the amount of city taxes would have to be increased more than 200 per cent to meet these requirements if it were not for the light plant revenues and the services furnished the city by a plant free of cost.

When the city issued the bonds to build the new plant, it was able to secure an outright gift from the Federal Government of \$22,500, to help modernize the plant and buy the new equipment. With sufficient money available, it was possible to construct a plant of ample capacity along the most modern lines.

The completed new plant now consists of one 300 hp., 4-cylinder Fairbanks-Morse Diesel engine direct-connected to a 250 kva. Fairbanks-Morse generator with V-belted exciter, together with a similar engine of three cylinders rated at 225 hp. at 300 rpm., direct-connected to a 150 kva. F.-M. alternator. The original 3-cylinder, 180 hp. Fairbanks-Morse engine, which had been in operation several years, was modernized with the addition of a new injection system, open heads, and water cooled exhaust manifold.

The horizontal exhaust manifold headers, covered with heat insulation, extend from the

water-cooled manifolds through the walls of the building and connect through an elbow direct to the bottom of the large S.T.P. type Fairbanks-Morse vertical exhaust silencers. The intake air reaches the engines through an underground air duct in the foundations, the air entering the duct through American Air filters which are mounted on vertical risers from the air ducts that extend to the outside of the building. The air filter for the original engine, on account of the lack of an air duct, was mounted on a vertical riser directly from the crankcase.

All three engines are equipped with Woodward governors, and Nugent fuel oil filters. An Alnor pyrometer outfit on the switchboard serves all three engines. The lubricating oil is regular filtered through edge type filters at the engine, and is reclaimed by a Youngstown-Miller chemical type oil reclaimer, which removes the entrained carbon, acid, and sludge and restores the oil to its original condition.

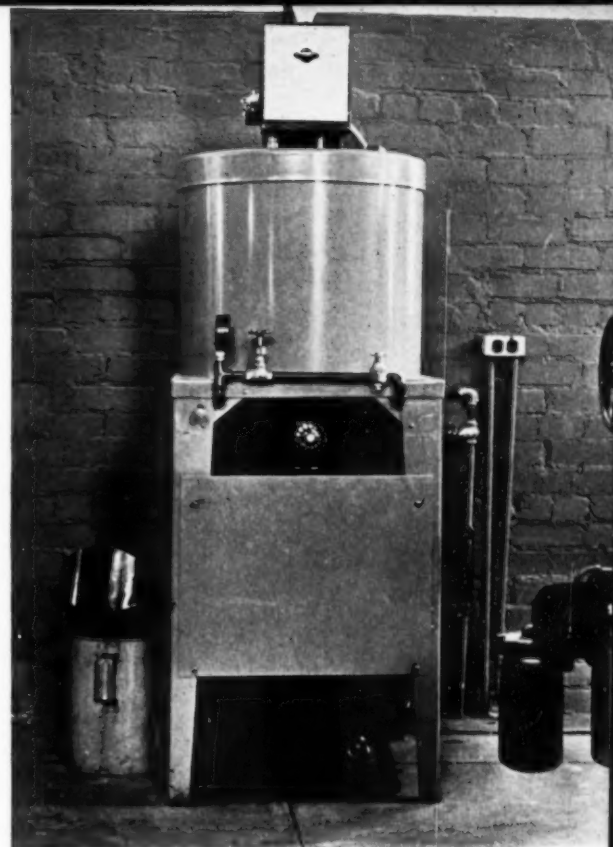
Since satisfactory cooling water is available directly from the water works reservoir supply located at the power plant, an open type cooling system, in use for some years and comprising a simple type cooling tower of conventional construction and necessary circulating pumps in duplicate, was considered suitable for this installation.

The switchboard, which is located midway of the power house adjacent to the operating end of the engines, is of the deadfront, enclosed type with all the necessary panel switches and instruments.

Duplicate starting units, comprised of a Curtis air-cooled, two-stage air compressor, V-belt driven by a US motor, and a Fairbanks-Morse compressor driven by a "Z" type gasoline engine, were included to supply starting air. A battery of four air tanks is located adjacent to the starting units. In this group also are the cooling water pumps, starters, and switches for the motors.

The plant at Sanger is located within twenty miles of the fuel supply which is procured from refiners at Gainesville, Teaxs, with the added advantage that the fuel can be trucked in. A highly satisfactory Diesel fuel at comparatively low prices is obtained by contract rates. The result is that the total operating cost per kilowatt hour ranges well under $\frac{1}{4}$ cent per kw. at present prices.

The interior of the building is very attractive, well ventilated and lighted, and is kept clean



Close up of the Youngstown Miller oil reclaimer as installed in the Sanger, Texas, Municipal Diesel Plant.

and neat by an efficient staff of operators under the direction of Mr. Daniel Davis, Chief Engineer, who has been in charge of this plant for some years. The building itself was originally a low-roof type structure upon which was built an additional height, at which time it was also enlarged and provided with ample facilities for the operators which included several rooms and lockers.

Under the present set-up, the town of Sanger also serves a good many rural customers connected to the lines which now extend and supply light and power to the two nearby communities of Bolliver and Valley View, these villages becoming customers of the Sanger plant under the new modernization program. The monthly revenue of the plant varies between \$2,200 and \$2,500, and it is growing rapidly. With the installed capacity of 700 hp., it is expected that the plant will be able to take care of the demand for some years to come without additional power. According to the city clerk, officials of several towns are watching the plant and have visited the Sanger installation, because this plant has become one of the show plants of North Texas, a region which abounds in successful municipal plants.

The engineering and modernization plans for the new Sanger plant was handled by H. B. Gieb & Company, Consulting Engineers, Dallas, Teaxs, who also supervised the installation.



One of Deutsche Lufthansa's Diesel-engined mailplanes after leaving the catapult rails.

DIESEL-ENGINEED TRANSATLANTIC MAIL PLANES

By PAUL H. WILKINSON

DURING the past two months, Pan American Airways and Imperial Airways have transported appreciable loads of mail and/or passengers across the North Atlantic in gasoline-engined airplanes. Although these flights were made during fair-weather Summer months, certain delays occurred which affected the delivery of the mail. These delays were in part due to transporting the mail on "combination" airplanes where the comfort and safety of the passengers was of primary importance.

Two of the most important requirements for airmail service are reliability and speed. Particularly is this the case across the North Atlantic where the distance is relatively short and a delay of a day or two nullifies the advantages of airplane transportation. On the North Atlantic route, the difference between flying time and steamship time is much less than on most transoceanic routes where delays do not appreciably detract from the time-saving advantages of the airplane. This calls for the special treatment of airmail transportation between North America and Europe.

In view of the rapid strides which have been made in aviation, there is no logical reason why regular 24-hour airmail service should not now be in operation between New York and London or Paris, or 30-hour service to Berlin.

In fact, such service should have been in operation last year and during most of the Winter months. Making delivery of airmail contingent upon passenger comfort, as is now being done by Pan American Airways, is only a compromise and results in inefficient air mail service to the public. For fast, regular all-the-year-round airmail service across the North Atlantic, a separate airmail service provided with specially designed mailplanes appears to be the solution to the problem.

The requirements for a mailplane, which would give really efficient service on this route, are not difficult to formulate. First, the airplane should be equipped with engines of very low fuel consumption so that with full load it will have sufficient range to fly *non-stop* between New York and Southampton or Lisbon, eliminating the present stop for refuelling at the Azores. Second, the airplane should be relatively small so that it is economical to operate and at the same time it should be designed for assisted or catapult take-off so that it is practically independent of the weather for departure. Third, it should be equipped with four in-line streamlined engines so that it will have maximum aerodynamic efficiency. Fourth, its engines should use non-inflammable fuel so that there is no danger of the airplane

and its valuable cargo being destroyed by fire. Fifth, it should be a flying boat so that it can alight upon the water in the event of engine trouble and remain afloat until rescued.

These difficult yet not impossible requirements for an all-the-year-round mailplane for operation across the North Atlantic, cannot be met by any of the equipment which Pan American Airways or Imperial Airways are now using. Nor can they be met by any of the equipment of Air France. Only the Diesel-engined Dornier Do 26 flying boats built for Deutsche Lufthansa have all these characteristics and these are the mailplanes which should now be in operation between North America and Europe.

In the illustrations accompanying this article, are views of one of these fast Diesel-engined mailplanes which incidentally was specially designed for the North Atlantic. Equipped with four 600 hp. Junkers Jumo 205-C Diesel engines, the Dornier Do 26 has a flight range of 5,500 miles and cruises at a speed of 193 mph. carrying a payload of 2,500 lb. This range is more than ample for a non-stop flight across the ocean. As for its size, this airplane is small enough for catapulting and despite its gross weight of 44,000 lb., it requires catapult rails only 100 ft. long to launch it into the air. The



Ready for take-off. The Dornier Do 26 flying boat is not dependent upon weather or water conditions for its departure.

fuel consumption of its four engines with the latter running at 70 per cent power output, is less than 600 lb. of fuel per hour. The streamlining of its engines mounted in tandem pairs, is excellent while their frontal area is approximately 65 per cent less than that of four radial air-cooled engines of equal power. Last, but not least, the use of Diesel fuel provides a sure

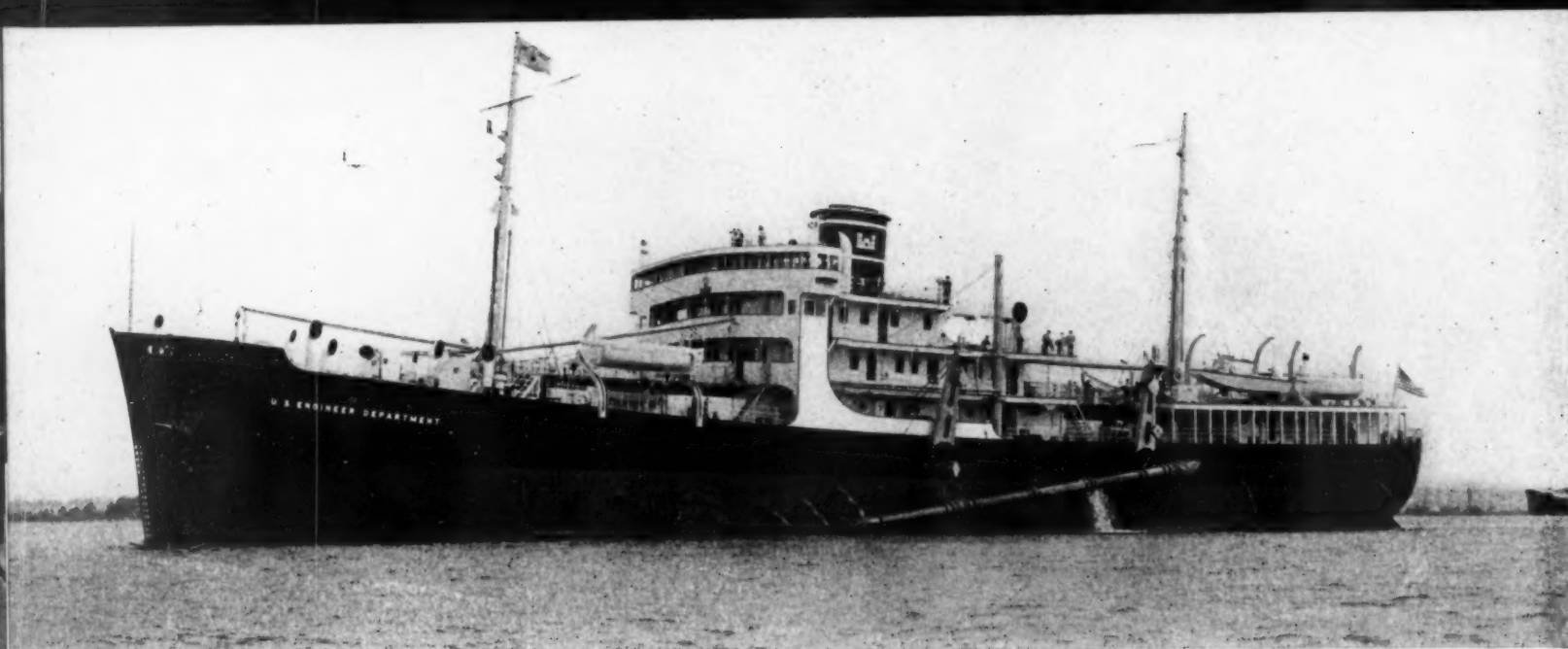
safeguard against fire which is taking such a terrible toll in aviation today.

When the question of a separate all-the-year-round airmail service across the North Atlantic comes to be discussed, considerable objections may be raised by the present operators of large gasoline-engined flying boats carrying passen-

gers and mail. It may be contended that they are able to give good airmail service with their present equipment and that special mailplanes would be too costly to operate. Whether such contentions are sound, will be shown by the regularity of the airmail service during the coming Winter months and by the amount of airmail which is carried across the ocean.

The sturdy Dornier Do 26 mailplane with its four Junkers Jumo 205 Diesels already has established an enviable reputation for itself across the South Atlantic.





The new Diesel Hopper Dredge, "Chester Harding" built by The Pusey and Jones Corporation for the United States Engineer Department.

DIESEL DREDGE "CHESTER HARDING"

By WILBUR W. YOUNG

ENTHUSIASM ran high among those present on the morning of June 28 as the much heralded and completely Dieselized *Chester Harding* started her long series of trials. In charge of her builders, The Pusey and Jones Corporation, the *Chester Harding* proceeded from the Wilmington Marine Terminal to her speed trials on the Delaware River and, as the day wore on, she took her equipment trials in stride. At every step throughout the trials proof was seen of masterful design and perfect coordination of the ship's varied and intricate mechanism.

Laid down in May, 1938, and launched on January 20, 1939, the *Chester Harding* is the United States Engineer Department's latest all-Diesel sea-going hopper dredge and the largest of her type in America.

The main engine room equipment is grouped around the two main propulsion engines. These are Busch-Sulzer, 8 cylinder, 16.5" bore, 24.5" stroke, 4 cycle Diesels developing 1,000 hp. at 250 rpm. each directly connected to individual propeller shafts through Kingsbury thrusts. The propellers are Birdsboro four blade, solid cast steel. Between the main engines are a Cooper-Besemer 6 cylinder, 600 hp. Diesel and Westinghouse D. C. generator

of 400 kw. capacity supplying the main electric current requirements for lighting and auxiliary electric drives, and an auxiliary generating set consisting of a Buda, 125 hp., 6 cylinder, 6½ in. bore, 8¾ in. stroke, 800 rpm. Diesel engine driving a Westinghouse 75 kw. D. C. generator. Another Buda 33 hp. Diesel and Westinghouse 15 kw. generator are provided for standby and emergency requirements. The Buda engines have built-in starting equipment including storage batteries near the engine bases and Leece-Neville generators and starting motors. They are also provided with DeLuxe, Clear Oil lube oil filters, and Puro-lator Fuel Oil filters.

Handling of exhaust from all engines is especially interesting. Vortex Spark Arrester-Silencers, six in all, effectively silence and extract soot and stack carbon. Due to the rapidly increasing number of motorships using air or electric whistles which have no tell-tale steam "plume," it is essential for the pilot to hear all audible signals. With the stack immediately abaft the bridge and insulated inside with felt on all surfaces, the value of quietness was clearly demonstrated during trials.

An elaborate control panel mounted in an inclined position above the engineer's station

carries complete equipment for remote control of the main engines and engine room auxiliaries. The repeaters, loud speaker, telephones, and air controls are within easy reach of the operator who stands in a recess between the two log desks. Gauges and instruments on the control panel for checking performance of the engines include three Weston Tachometers, one for each of the propulsion engines and one for the main generating engine, in addition to which there are two Weston Tachometers, one for each main engine, in the wheel house.

Power for the two Ellicott Dredge Pumps is supplied by two Cooper-Besemer 650 hp. Diesels which are equipped with Keller Model 3V drill type air starting motors.

Two General Electric motor driven Ingersoll-Rand air compressors, each supplying 40 c.f.m. at 350, discharging into four 10 feet by 5 feet tanks, furnish starting air for all Diesel engines, except the 15 kw. emergency set. Likewise, a closed circuit cooling system, consisting of two units on opposite sides of the engine room handles the cooling for all engines except the small set which is radiator cooled. Each unit is made up of a Griscom-Russell No. 118-180 heat exchanger, Worthington 1,200 g.p.m. raw water pumps and Nash 400 g.p.m. jacket water pumps.

View of the central control station from which both main propulsion engines are maneuvered. This board also carries instruments for checking performance of the main and auxiliary generating engines.

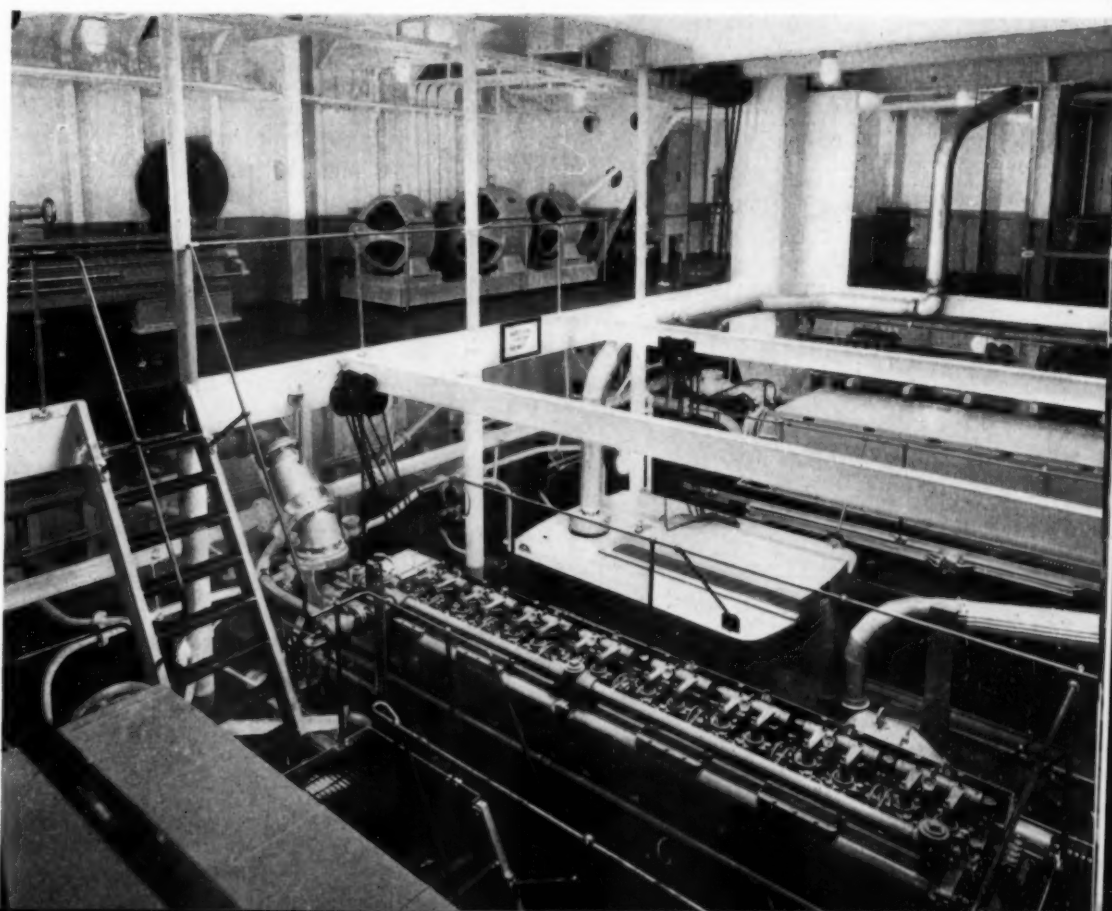
The circuit for each cooling unit includes one propulsion engine, one pumping engine and one generating engine. Fresh water is pumped from the storage tank located in the double bottom, to the lube oil cooler, then to the engine jackets, and through the heat exchanger back to the tank. Either of the two 50 hp. fire-and-bilge pumps may be cut in for emergency raw water circulation.

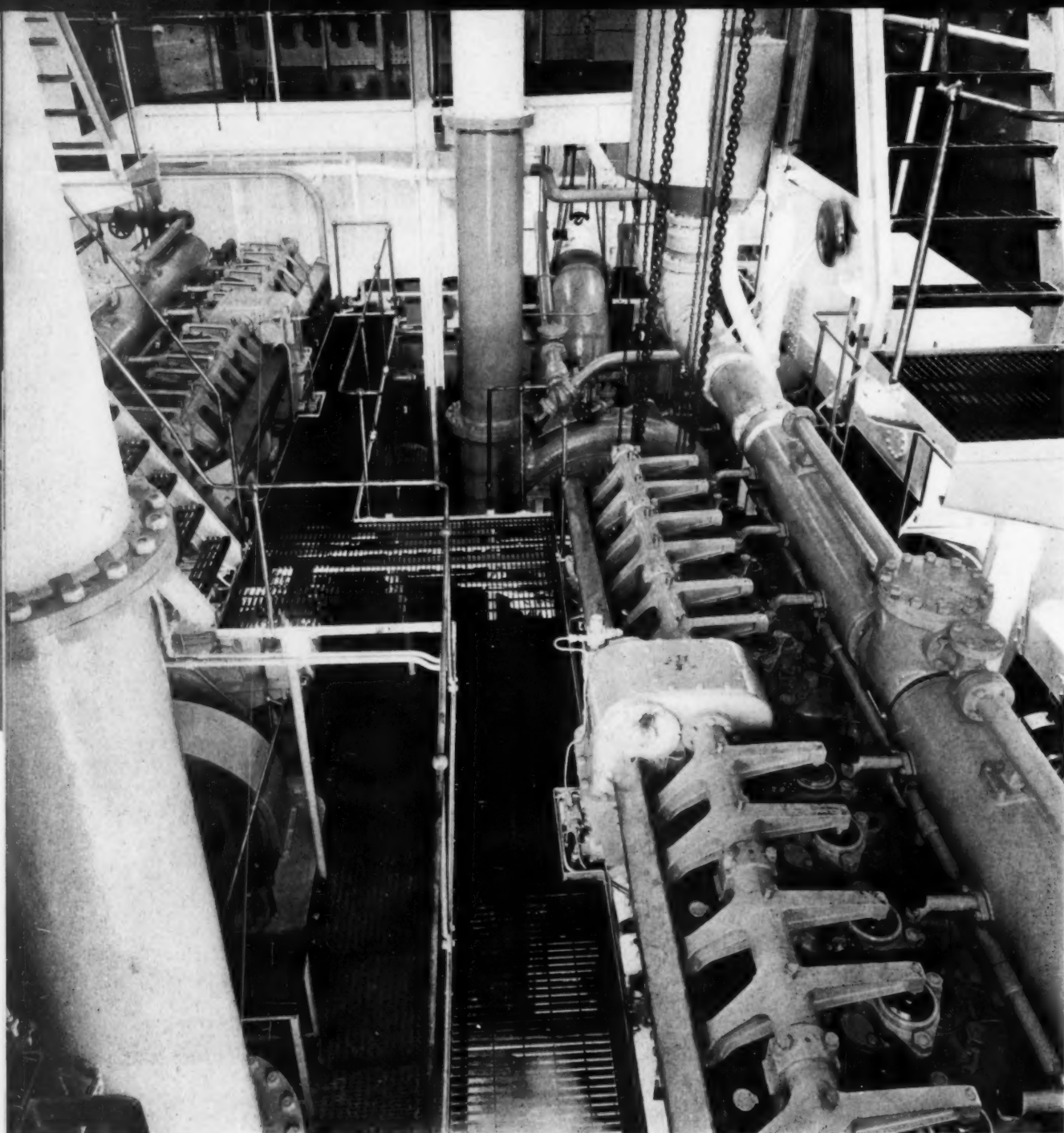
The lube oil system is also arranged for common service to all engines. A 1,200 gal. main supply tank supplies oil by gravity to the pump tanks, two of which are of 1,200 gal. capacity and serve the main engines, and two of 600 gal. capacity serving the dredging engines. Two Worthington 100 g.p.m. rotary pumps with single General Electric motor drive are installed for each propulsion engine. One pump supplies oil from the sump tank to the engine bearings. The other pump removes oil from the crankcase and returns it to the sump tank by way of the cooler. A similar standby dual pump unit is installed to service either engine. All other engines, except the small generator set, have built-in lube oil pumps. Lube oil reclamation is handled by a Sharples 200-250 g.p.h. monel bowl centrifuge with built-in pumps and heater. A Worthington 25 g.p.m. lube oil transfer pump is arranged to empty all sump tanks if necessary.

Two Sharples 300-450 g.p.h. monel bowl centrifuges are provided for cleaning all fuel oil. A Worthington 100 g.p.m. rotary transfer pump is so connected that it may move fuel oil from tank to tank or overboard. The built-in centrifuge pumps bring fuel oil from the bunkers to the centrifuges and from thence the pumps pass the oil to the clean oil tank. Built-in engine pumps move the oil to the service tanks, provided for each engine, from whence it flows by gravity to the injection systems.

The main switchboard, located in the engine room is a steel, deadfront type and is fitted with controls for coordinating the vast amount of electrical equipment, also controls for the

General engine room view showing the two Busch-Sulzer 1,000 hp. main Diesels, extreme left and right, with the Cooper-Bessemer 400 kw. main Diesel generating set, and the Buda 75 kw. auxiliary generating set, center, in sound proof steel enclosure.





View of the two Cooper-Bessemer 650 hp. Diesels which drive the two Elliott dredge pumps.

main and standby generator sets. A small switchboard above carries the controls for the 16 kw. emergency generator set.

A Viking Instrument alarm system actuates light and sound signals on the main engine room control panel in the event of excessive jacket water temperature or low lube oil pressure in any of the six Diesel engines aboard.

The ultimate purpose of all this equipment is, of course, to carry on dredging operations—so let us see how this is done. The *Chester Harding* is essentially an all steel, two compartment hopper dredge having an overall length of 308 feet, 2 inches, breadth 73 feet, draft light 11 feet 10 inches. The dredging operation consists of lowering 85 feet drag pipes

fitted with suction heads on each side of the vessel and pumping the hoppers full, their total capacity being 2,500 cubic yards. The ship then proceeds to a dumping ground where the hoppers are emptied through hydraulically-operated gates located in the bottoms of the hoppers.

Designed in stream-lined form, the bridge overhangs to ship's side, port and starboard, curving forward at the centerline and is entirely enclosed by some sixty brass-framed Kearfott windows, front and back, arranged to offer 100 per cent unobstructed vision. The enclosure is formed into an all-steel wheel house and chart room at the back of the bridge, which is equipped with the most up-to-date navigating and inter-communication system, including a

radio direction finder, electric steering stand, gyro compass, Guided Radio loud speaker talk-back system, remotely controlled 1,000 watt, 18 in. search-lights, American Locomotive automatic draft indicators, fathometer and hydraulically controlled watertight door system. The stack is streamlined, decorated with stainless steel banding and a stainless steel U. S. Engineer Department emblem.

The *Chester Harding*, which cost \$1,800,000, is a handsome craft with smart lines and substantial sea-going qualities. She was built to the highest American Bureau Classification Rules and will be certified upon completion by the U. S. Bureau of Marine Inspection and Navigation prior to delivery at New York for dredging service.

DIESEL TOWBOAT "EDWARD W. RENWICK"

ONE of the most interesting marine auxiliary Diesel engine installations of recent months has been made on the towboat *Edward W. Renwick*, launched at Manitowoc, Wisconsin, in April.

The ship was constructed by the Manitowoc Ship-Building Company and is in service for the Marine Transit Company of Chicago. She is registered from Gary, Indiana.

A model ship as far as efficiency and economy go, the *Edward W. Renwick* is 100 feet long by 25 feet wide. Under normal conditions, she draws approximately $5\frac{1}{2}$ feet forward, and a little over six feet aft. Her displacement is about 350 tons.

Two 300 hp. direct-reversing Diesel propulsion engines turn 64 in. diameter by 40 in. pitch propellers at 250-300 rpm. On her trial run from Manitowoc to Chicago, she was logged at 9.5 mph. at 270 rpm.

Two Caterpillar four-cylinder, 20 kw., D.C. generator sets are installed athwartship in the forward end of the engine room, with the generators outboard and the switchboard in between. One engine will be running at all times that the boat is in use and, with the two units, all electrical current will be supplied to the ship. Tests have shown that a single set is sufficient to provide power for all equipment with the exception of the steering gear and capstan.

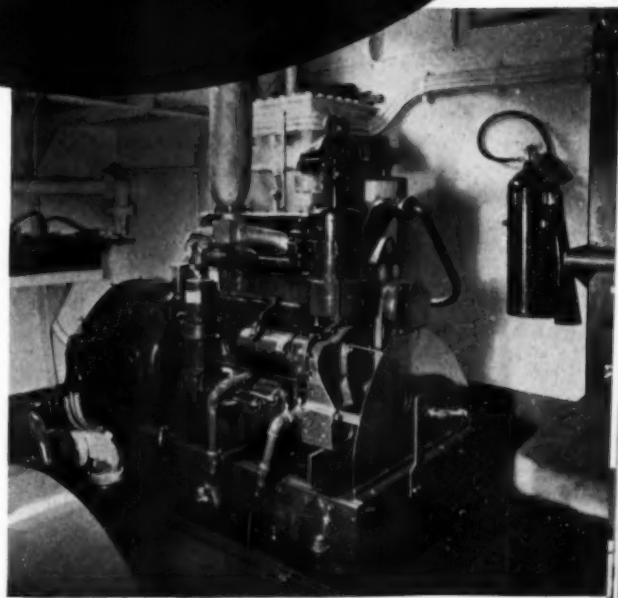
The equipment powered by the units includes the fire and bilge pump, the air compressor for main air flasks, the hydraulic steering gear, fuel transfer pumps, mechanical refrigeration system, an incandescent and an arc searchlight, the oil burning boiler for heating purposes, two small motor generator sets for charging the



ship's batteries, the fresh water pump, electric heater for the pilot house, capstan, and all electric lighting.

The most unusual job that the Diesel-electric sets have to do is to power the hydraulic controls for adjusting the height of the pilot house. To enable the ship to clear very low bridges in river service, the pilot house can be raised and lowered as desired. At its lowest, and with the stacks unmounted, the ship has an overall height of only 13 feet, seven inches from the water.

The ship has an all-welded steel hull of the tunnel type. The deckhouse has a central fore and aft companionway, and has accommodations for six deck hands, two engineers, a chief engineer, two pilots, and a spare cabin. The mess room and the galley are forward, and directly above these are the captain's cabin and a spare stateroom.



Top—"Edward W. Renwick" at her dock in the Chicago River.

Center—One of the two Diesel Electric Generating Sets in the main engine room.

Right—General view of auxiliaries, switchboard and instrument panel.

ST. CHARLES, MISSOURI

By ORVILLE ADAMS and R. D. CAMPBELL

ON October 8, 1938, the city of St. Charles, Mo., completed the final step in the modernization of its city water system, and began to pump the water with Diesel engines. The city was formerly supplied with water by a private company which used steam power for water pumping. In 1908, the city bought out the entire properties of this company, and continued to operate with steam for many years. Steam power proved quite expensive in recent years, for the equipment depreciated and finally became obsolete and inadequate. Then electric motors were installed in February 1927. While considerable savings were realized, the power bills ranged from \$1,500 to \$1,800 per month the first year.

Among major improvements in the equipment during 1936-38 were a modern filtration plant and a water treating system, new 10 inch cast iron mains put down in the business district, a new intake house and screen, and the installation of Diesel engines to produce electric power for the water system.

The city of St. Charles has a population of 11,000 and is located on the Missouri River just 20 miles west of St. Louis. It is one of the oldest towns in St. Louis, dating back to French settlements. Located along the river banks, it has attracted a number of nationally known industries that require large quantities of water and river transportation. Freight packet boats running between St. Louis and St. Charles and Kansas City, many of them Diesel equipped, dock at St. Charles where the splendid railroad and highway facilities developed in recent years have contributed to make this city an important center for the manufacture of heavy machinery and railway equipment. It can be seen that large quantities of good water at low rates to industries and people were a primary necessity, requiring the most efficient means of power production.

When it was decided to install Diesel engines, the city was in good condition financially and no bond issue was required. The water department had considerable cash on hand with which to make an initial payment on the equipment, with the remainder to be paid out of revenue to be realized from the economy of Diesel engine operation.

The engineering details were handled by the firm of Russell and Axson, Consulting Engi-

neers employed by the city council. When the plans were completed, the city advertised for bids in February, 1938, on the Diesel engines, generators, and switchboard equipment. After all bids were analyzed, the general contract covering equipment and installation was let to Fairbanks, Morse & Company.

This modernized pumping station is now equipped with three Fairbanks-Morse model 32E14, two cylinder, 150 hp. two cycle, 14 in. bore, 17 in. stroke, back flow scavenging, solid injection Diesel engines. Generating equipment consists of three Fairbanks-Morse 97 kw., 60 cycle, 2,400 volt alternators mounted on the engine shaft extensions with 125 volt, 1,750 rpm. exciters Vee belt driven from a pulley on the generator shaft extension. American filters, number 2 O.C.H., of the viscous impingent type handle the engine intake air. For engine starting an electric motor driven single stage Fairbanks-Morse compressor supplies air at 250 pounds pressure to three Pressed Steel Tank Co., 20 in. x 60 in. storage tanks furnished through Diesel Plant Specialties Co.

Engine fuel is Shell "Dieselene" supplied by gravity from a 10,000 gallon horizontal tank mounted on concrete saddles on high ground adjacent to the engine room. Lubricating oil is Shell Talpa Diesel oil (241), S.A.E. 30. Fuel oil is transferred from tank car to storage by a 1½ in. Model 5135 -M rotary type transfer pump driven by a 2 hp., 1,730 rpm. electric motor with geared head. This pump has a capacity of 35 gpm. against a 60 foot head.

A 5 panel switchboard with swing-bracket for synchronizing instruments is arranged as follows: three 28 in x 78 in. engine panels, each equipped with A. C. ammeter, D. C. ammeter, kw. meter, concentric mounted exciter and alternator field rheostats, remote governor control, main circuit breaker switch, and integrating kwh. meter; a 24 in x 78 in. master power panel with A. C. ammeter, circuit breaker, and integrating kwh. meter; a 24 in. x 78 in. control panel with power factor indicator, frequency indicator, and Simplex Voltage Regulator. All switchboard instruments have 5 in. round faces and were manufactured by the Hickock Electric Instrument Company of Cleveland, Ohio. The board was made by the Wm. Murdock Electric Manufacturing Company of St. Louis, Missouri.

The engine gauge board measures 28 in. x 24 in. with three 4½ in. pressure gauges, 0-50 pounds, for engine cooling water, an Edwards signal horn for low pressure or high temperature water alarm, and an Alnor, 6 point exhaust pyrometer with thermocouples at each cylinder exhaust.

Tests consisted of three hour runs each at quarter load and two hour runs at 10 per cent overload. The table following gives the high points and results of these tests with comparisons to the builder's guarantees.

Load Unit	Total Kw.-hr.	Average Load in Kw.	Lb. Fuel Used	Fuel Lb. Kw.-hr.	Fuel Guarantee lbs. Kw.-hr.
No. 1					
1/4th	69	23	63.5	.9003	1.0140
1/2	145	48 1/3	93.0	.6414	.7090
3/4	220	73 1/3	124.0	.5636	.6140
4/4	291	97	157	.5395	.5870
No. 2					
1/4	68	22 2/3	63	.9265	1.0140
1/2	145	48 1/3	84.0	.6483	.7090
3/4	225	75	126.0	.5600	.6140
4/4	287	95 2/3	158.5	.5523	.5870
No. 3					
1/4	75	25	64.5	.8600	1.0140
1/2	143	47 2/3	90.5	.6329	.7090
3/4	223	74 1/3	122.0	.5470	.6140
4/4	288	96	155.4	.5396	.5870

No data is quoted for the overload run as no fuel guarantees are made for this condition. Each unit was run for two hours at 10 per cent overload, without appreciable changes in the operating condition. The overload test was of much importance, however, as the engines operate at or above 95 per cent of full load rating practically all the time. The units are rated at 97 kilowatts and the load varies from 97 down to 93 kilowatts per unit on the line.

Since the addition of the Diesel engine equipment requires no additional labor, the operator who formerly attended to the electric motors and pumps now operates the engines and the pumps. The current is generated at 2,400 volts, with some of it being used at this voltage, while some of it is transformed to 440, 220 and 110 volts for the various equipment in the plant. One Diesel engine furnishes the power required for the raw water pumps, the small equipment at the filtration plant and the engine auxiliaries. This load is approximately 90 to 95 kw., and each generator is rated at 97 kw., which results in a perfect load for one unit. When

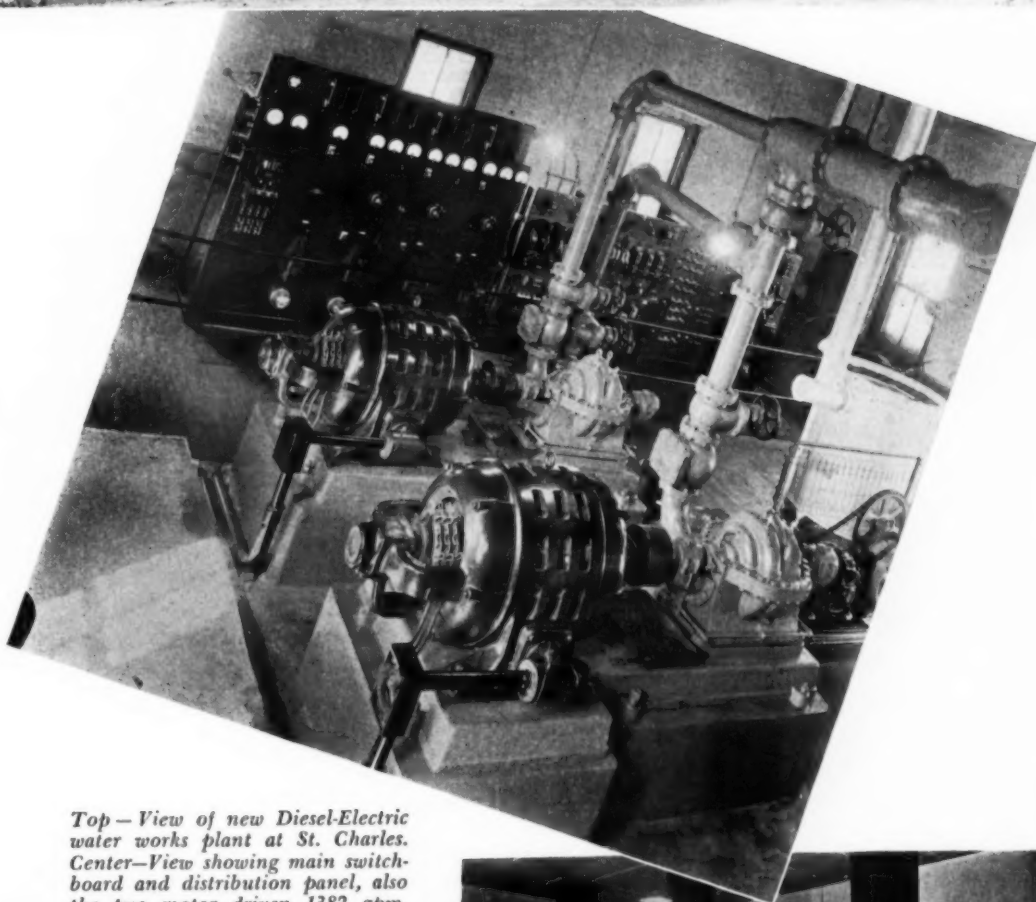
one of the 200 hp. filtered water pumps is operated, two engine units are required. This large motor, together with the auxiliaries and filtration plant requirements, makes a total load of about 190 kw., which is an ideal condition for two of the generating units, leaving the third unit in reserve as a standby.

During the winter season, the plant operates from six to eight hours per day, while in summer the plant operates twelve to fourteen hours per day. Cooling water for the engines is taken from one of the filtration plant reservoirs located about 50 feet from the engine room, but at an elevation of 12 to 15 feet above the engine cylinders. This arrangement insures water being in the engine jackets at all times. The circulating pumps for the engine cooling return the water to the same reservoir from which it was pumped. All three cooling water pumps are connected to a common water header which supplies all engines. This arrangement permits the use of any pump or combination of pumps to cool any engine or combination of engines.

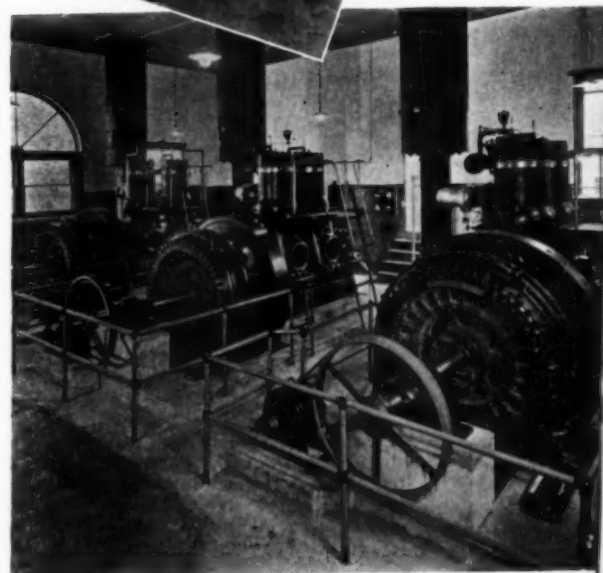
The cooling water piping is arranged with a by-pass line from the cooling water discharge header to the suction side of the pumps. In this manner the cooling water temperature is controlled without decreasing the amount of water circulated through the engine jackets. The temperature of the inlet water to the engine is maintained at 115°F., and the outlet water is kept at approximately 125° F., regardless of the temperature of the water in the reservoir from which the water is obtained.

Raw water is taken from the Missouri river through a screen-house, and flows by gravity to the raw water pumps located in a pit under the main pump house. The distance from the water intake at the screen house to the pumping plant is about 300 feet. The main floor of the pump house is some 20 feet above the normal level of the river, while the filtration plant and the reservoirs are located on a small bluff approximately 50 feet above the normal river level. Transfer of water within the filtering system is done by gravity. All pumps are so located with respect to the water handled that each has a slight pressure on the suction side, eliminating the possibility of losing the prime at any time.

When the water has been filtered and treated, it is then pumped into the city mains at a pressure of 95 lbs. per sq. in. The pressure in the business district varies between 60 and 75 pounds, depending upon the elevation at various points. A part of the city water supply

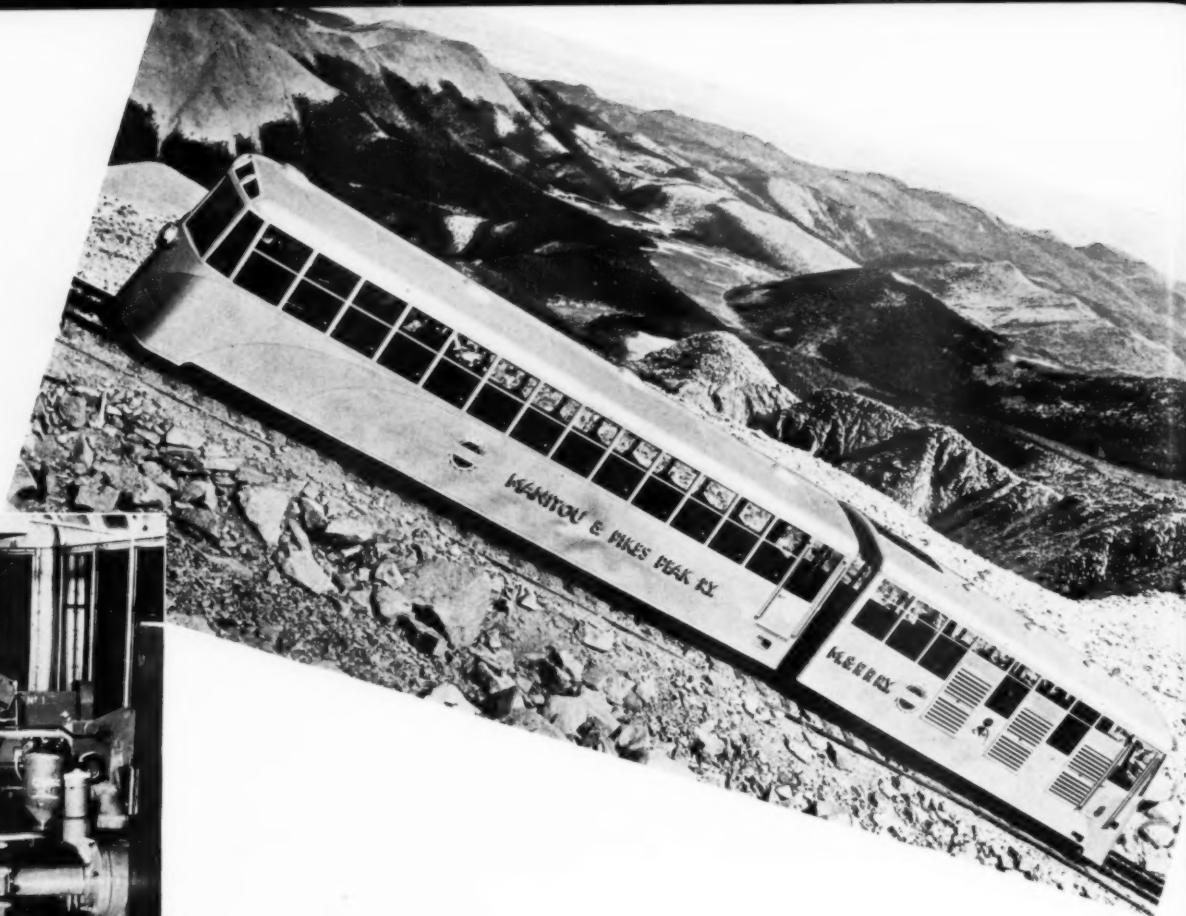
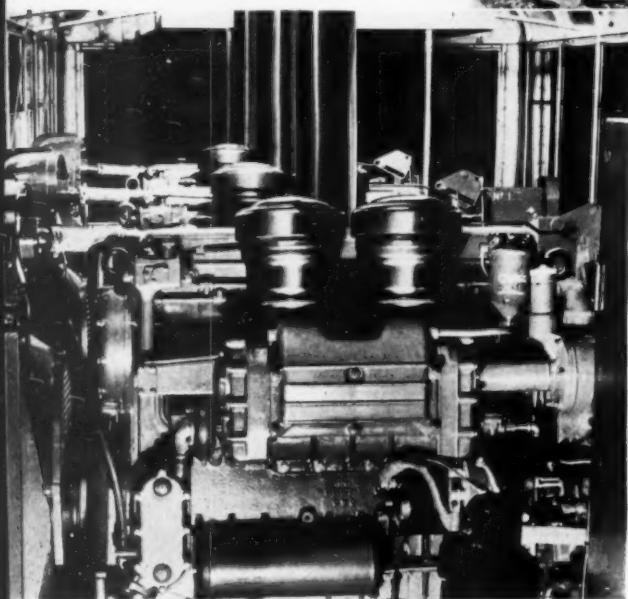


Top—View of new Diesel-Electric water works plant at St. Charles. Center—View showing main switchboard and distribution panel, also the two motor driven 1382 gpm. centrifugal pumps. Right—The three Fairbanks-Morse Diesel engines, generators and exciters. Note Maxim B.R.M. exhaust silencers.



system is two 1,500,000 gallon surface type reservoirs located on a hill above the city. These are connected to the system of water mains and receive water when the pumps operate and supply the city water when the pumps do not operate. This combined capacity of both reservoirs constitutes a full 24 hour supply of water for the city, if the pumps are not in operation. The details of arrangement and duplication of equipment in the St. Charles water supply system insures an adequate supply of water under most adverse conditions.

Right, the new Diesel-propelled passenger train negotiating one of the 25 per cent grades that make the Pikes Peak Log road the highest and steepest scenic railway in the world. Below, view of the engine compartment showing the three Diesel-Generating sets. The engines are 6 cylinder models of the small, or 71, Series 2-cycle power plants produced by General Motors.



NOW—DIESELS FOR PIKES PEAK RAILWAY

STEAM trains that each summer have carried thousands to the summit of Pikes Peak in the half-century the cog road has been in existence are giving way before the advance of Diesel engines. Taking advantage of the increased efficiency of the modern Diesel-electric drive, the Manitou and Pikes Peak Railway is placing in service the first of what is expected to be a fleet of streamlined passenger locomotives powered by General Motors 2-cycle Diesel engines.

The power plants selected for this service are 6-cylinder models of the 71 series. Rated at 160 hp. each at 1,800 rpm., these engines weigh approximately 10 pounds per hp., an important consideration in their choice, since the fact is well established that at a speed of only 10 mph., it requires 14 hp. to haul every additional ton up the 25 per cent grades that must be negotiated.

With three 6-71 engines furnishing the motive power, tests have shown that the Diesel locomotive will reduce the running time 30 per cent or more, pushing a new 52-passenger car

up the steep slope to the summit, 14,109 feet above sea level, in a little more than an hour. Operating costs, at the same time, are being cut in half. The 26-foot locomotive weighs 23 tons and the 40-foot observation car, 12 tons, fully loaded. With a record of never having injured a passenger, though theirs is the highest and steepest scenic railway in the world, officials of the cog road likewise were influenced in selection of new equipment by the added factor of safety the Diesel-electric drive affords.

Besides a double cog, mechanical hand brakes, air brakes and a dead man control that automatically sets the latter as soon as the engineer removes his foot from the pedal, the new General Motors Diesel-powered locomotive built for the Pikes Peak and Manitou Railway has what is known as a dynamic braking system.

With this system, the electric traction motors that supply power to the cog through reduction gears while ascending the peak become generators during the descent. Resistance units absorb the electrical energy generated by the motors when the locomotive is on the down-

grade, the speed being controlled by the number of coils brought into play. The fewer the number of units made available for the absorption of electrical energy, the slower is the speed of the train. The system operates independently of the Diesels, which are shut down completely upon reaching the summit, and are required only in making the 9-mile climb. Should anything go wrong with the dynamic braking system, the air brakes are always available, since an axle-driven compressor is provided for such an emergency.

Another safety feature lies in the manner in which the Diesel engines, the generators they drive, and the traction motors are hooked up. Each engine, generator, and motor form a single unit, having no connection with the others. As a consequence, the failure of one or even two of the units would have no effect other than that of slowing down the locomotive, which is engineered so it can still reach the summit under full load with only one power plant in operation. There is also an electrical device to prevent overloading and stalling of the engines.



The "Fidus," formerly a sub-chaser, is now outfitted for party fishing trips and equipped with a Diesel propulsion engine.

"FIDUS"

A Diesel Converted Sub-Chaser

By E. SCHOONMAKER

THE *Fidus*, formerly sub-Chaser 101, built by the Elco Boat Works in 1917, is now gainfully employed in a successful peace-time pursuit. This trim looking ship became a party fishing boat during 1925, but not until her three 220 hp. gas engines had been replaced with a single 150 hp. Fairbanks-Morse "C-O" engine. For almost 15 years it operated this 110 x 14.9 x 6 ft. boat profitably, under the banner of Captain Phillip Wright, out of Sheepshead Bay, his present starting point.

When a change of engine recently became inevitable, Captain Wright chose a 4 cycle, 8 cylinder, 280 hp. Fairbanks-Morse engine. The old bed required only a "trimming" to accommodate the deeper flanges on the new engine. Operation began May 1, since which time this engine, with its Joe's Reduction Gear, has given a good account of itself.

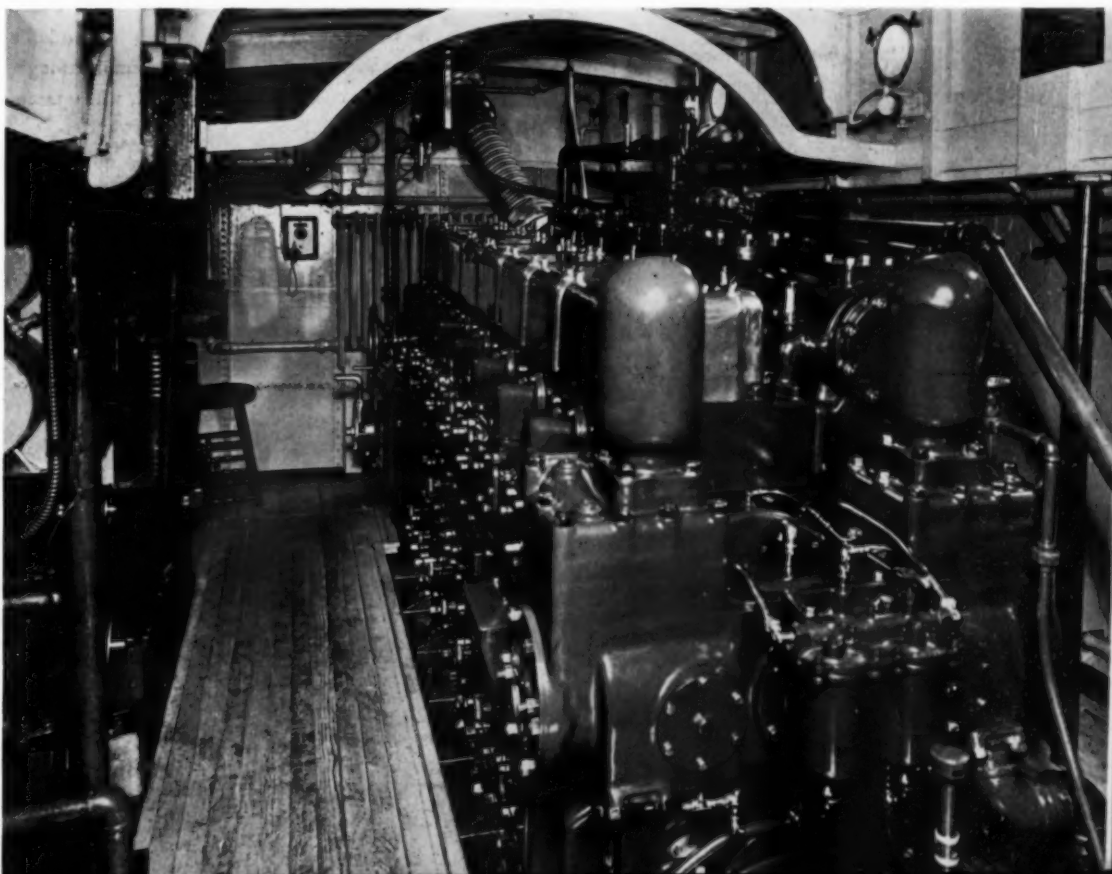
Other accessories include the main fuel pump on the exhaust side that supplies the day tank, from which the fuel runs to two engine mounted Purolator oil strainers before passing into the main fuel line. As a safeguard against low pressure, an automatic lube oil bell alarm is installed and a further protection against undue wear is afforded by the use of DeLuxe oil strainers.

When the main engine is not in operation, the six air bottles installed on each side of the hull are kept charged by a Fairbanks-Morse 3 hp.

engine and a single stage air compressor. This 3 hp. engine is also connected to a Kinney rotary type plunger pump for general service, and a Fairbanks-Morse 32 volt light plant mounted on the same channel irons is used for battery charging and peak load requirements. The switchboard is just abaft this equipment, on the rear engine room wall, containing the usual switches for battery charging and light circuits, together with an ammeter and a voltmeter. Two 180 gallon fuel tanks are located

on the other side of this bulkhead, while space was found forward in the engine room for two 85 gallon lube oil tanks. Flexible hose from the engine exhaust runs up through the stack into a Maxim Type BC silencer. There is ample room to move freely around the engine and its auxiliaries, which also include a spray nozzle test stand mounted on the work bench. A space amidship, measuring 20 ft. in length by 14.9 ft. in width is devoted to all of this equipment.

General engine room view, showing the 150 hp. Fairbanks-Morse main propulsion engine.



HILL OFFERS A 5 KW. DIESEL SET

*An Important Development Just
Announced by the Hill Diesel
Engine Company.*

By WILL H. FULLERTON



THE Hill Diesel Engine Company of Lansing, Michigan, has just made an extremely interesting announcement—the offering of a new 5 kw. and 7½ kw. Diesel-electric set. These new units come on the market at a very opportune time because there is a rapidly developing demand for Diesel-electric sets of this particular size. In brief, the new 2R Hill Diesel engine is a 2-cylinder, 3½" x 5½", rated at 15-20 hp. at 1,200-1,800 rpm. It is a 4-cycle full Diesel type, using the Hill system of Diesel combus-

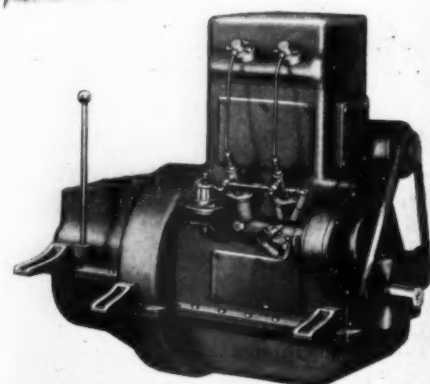
tion and injection: A simple accessible unit with all the necessary accessories built into the engine.

The Hill Model 2R has been designed to give heavy duty performance and is conservatively rated for the work which it is to perform.

The Hill Diesel generator set, rated at 5-7½ kw., is ideally suited for the power and light requirements of thousands of small factories, garages, tourist camps, irrigation projects, building and conservation projects, etc., where it is vitally necessary to obtain dependable power and light from a plant small enough, dependable enough, and yet which will operate very economically.

In the Hill 2R line are both AC and DC generator sets, direct stationary power units, portable power plants, and marine engine applica-

tions with inbuilt reverse gears and reduction gear units.

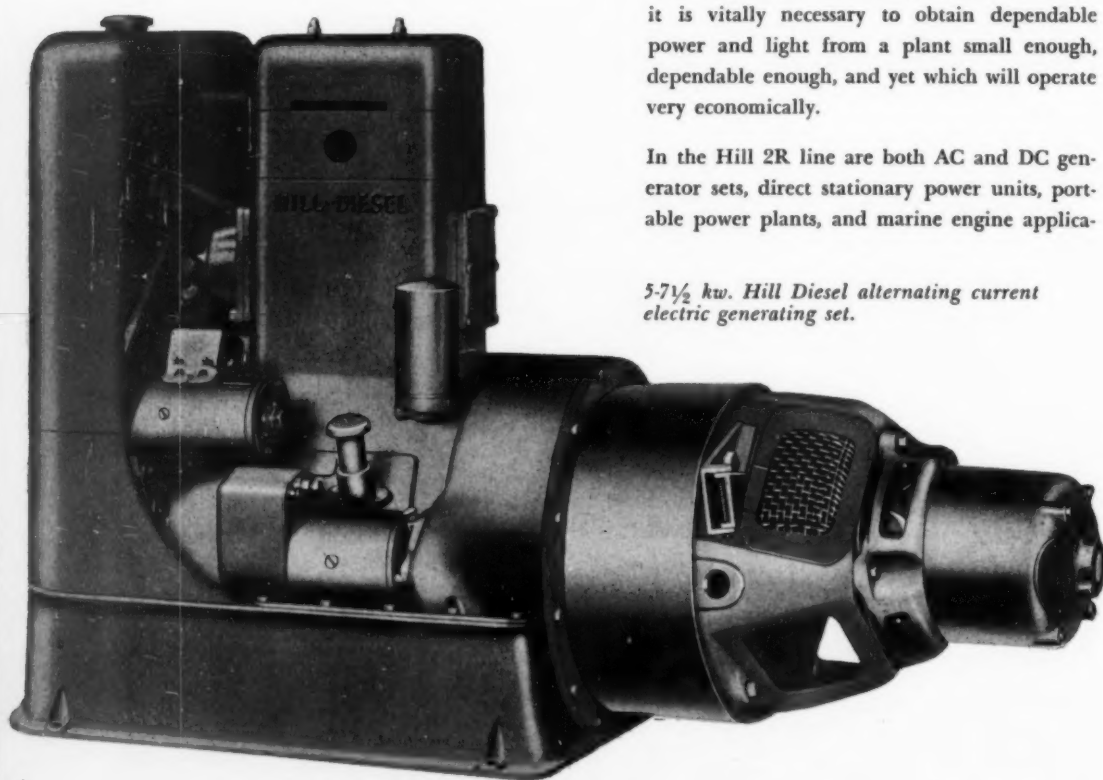


The Model 2R Hill Diesel engine is equally as adaptable to marine service, as illustrated above.

The new Hill generator set is balanced to operate on rated power loads at a cost per kw. of 1 cent, or possibly a little less, depending on the local fuel oil delivery cost.

This new unit offers a splendid opportunity for Diesel engine dealers throughout the country who now sell a larger line of engines. The Hill people have produced a splendid piece of dealer literature, giving full details on this new engine, and we recommend that all dealers interested in such a small set communicate immediately with the Hill Diesel Engine Company, Lansing, Michigan.

5-7½ kw. Hill Diesel alternating current electric generating set.



Latest Diesel Patents

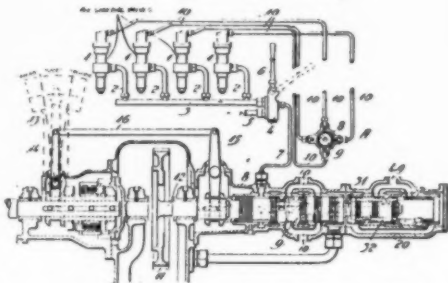
A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.

Conducted by C. CALVERT HINES*

2,157,578

REVERSIBLE INTERNAL COMBUSTION ENGINE

Edvin Ossian Parcival Thege and John Henry Dilliam Julius, Stockholm, Sweden, assignors to Aktiebolaget Atlas Diesel, Sickla, Sweden. Application April 23, 1936. Serial No. 75,912. In Sweden April 27, 1935 (7 Claims. (Cl. 60-16))

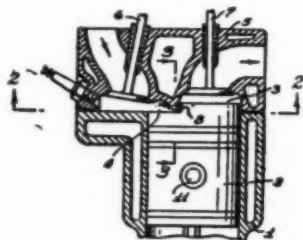


1. A reversible internal combustion engine of the kind in which air is compressed in the engine cylinders including pneumatically actuated relief valves for discharging air compressed in said cylinders, distributing valve means mechanically operated from the engine for automatically supplying compressed air to said relief valves at timed intervals to open the same at the ends of the compression strokes of the respective cylinders, and engine control means including an operating member shiftable to forward and reverse positions, said distributing valve means including mechanism operable to continue to supply compressed air to said relief valves after shifting of said member from one of said positions only so long as the engine continues to rotate in the same direction as that occurring prior to the shifting of said member.

2,161,133

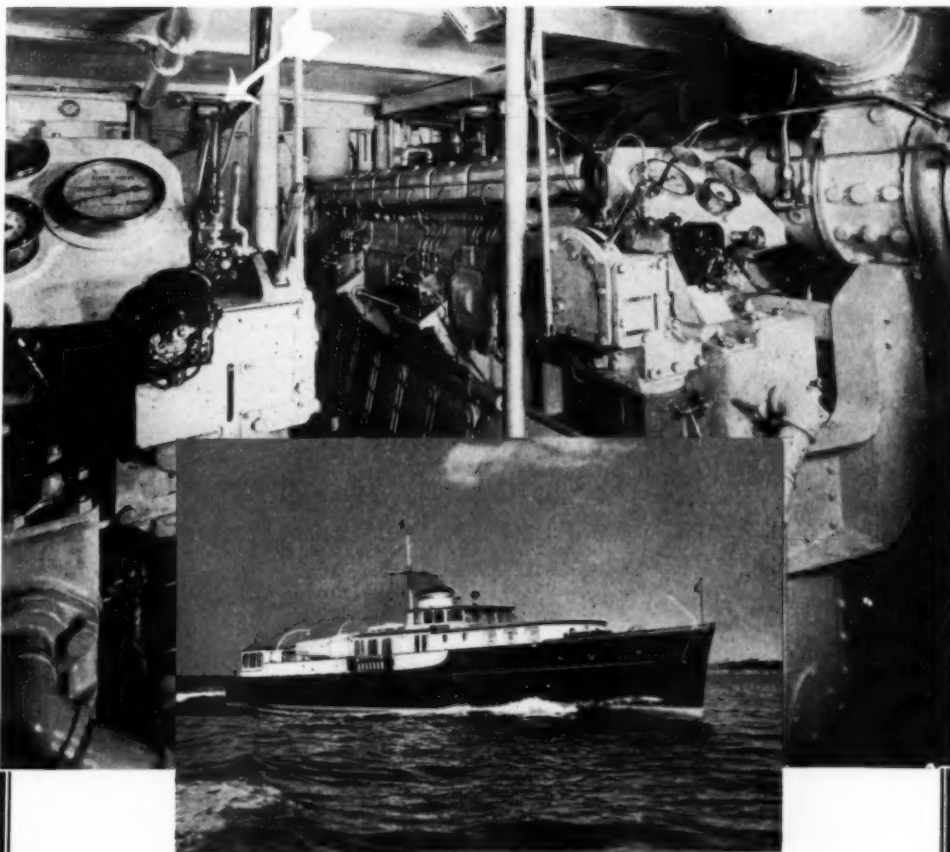
CYLINDER HEAD CONSTRUCTION

James P. Burke, Knoxville, Tenn., assignor of one-half to F. L. McLaughlin, Detroit, Mich. Application January 27, 1938, Serial No. 187,144 13 Claims. (Cl. 123-191)



1. A combustion chamber for an engine cylinder having a projection depending thereinto from the top thereof, said projection having a less vertical thickness at one portion than at the remainder thereof.

*Patent Attorney, Washington Loan & Trust Building, Washington, D. C.



ALNOR Protects Fastest Diesel Yacht

THE Yacht *Trouper*, built by Robert Jacobs, Inc., for C. A. Tilt, President of Diamond T Truck Company of Chicago, is reported to be the fastest yacht afloat. It is powered by two Cooper-Bessemer 8-cylinder 4-cycle direct reversible Diesels.



By protecting these Diesels with an Alnor 16-point pyrometer shown in view of engine room above, the engine builder has doubly assured dependable engine performance, and added safety to passengers and crew.

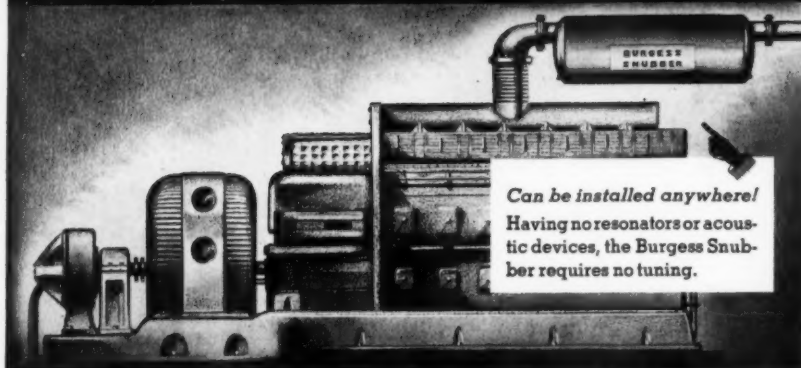
Alnor Exhaust Pyrometers can now be furnished in switch capacities of from 2 to 36 points in a single instrument.

Write for Complete Catalog

ILLINOIS TESTING LABORATORIES, Inc.
423 NORTH LaSALLE STREET • CHICAGO, ILLINOIS

"Alnor Pyrometers"—The ENGINE X-Ray

You don't have to "TUNE" this new type of DIESEL SILENCER



Can be installed anywhere!
Having no resonators or acoustic devices, the Burgess Snubber requires no tuning.

Prevents Exhaust Noise . . . Keeps Fuel Consumption Low

You positively prevent noise with the Burgess Snubber, regardless of the length of exhaust piping or the Snubber's location in the exhaust system. The Burgess Snubber employs a new method of preventing exhaust noise by "snubbing" the slugs of high-pressure gas and dissipating them before they detonate in the atmosphere. An unrestricted passage is provided for the gases exhausted during the scavenging stroke. Thus, exhaust pipe roar is avoided by eliminating pressure peaks.

Fuel consumption is not increased and engine efficiency is not reduced with Burgess Snubbers. Unlike conventional exhaust mufflers, they do not build up peak back pressures. With the Burgess Snubber, there is no critical length of exhaust piping at which fuel consumption is increased and engine efficiency is reduced. Burgess Snubbers are equally effective for quieting two-stroke and four-stroke engines.

Burgess also offers the Spark-Arresting Snubber and Intake Snubber. Mail coupon for further information.



Sectional view showing construction of Burgess Snubber.

BURGESS SNUBBERS

Patents Applied For

SEND FOR DATA BOOK

Burgess Battery Co., Acoustic Division
Dept. DPR, 500 W. Huron St., Chicago, Ill.
Send me booklet, "Snub the Slug and Stop the Noise."

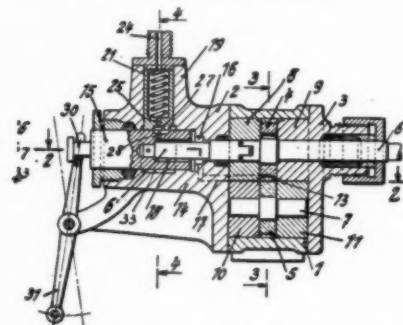
Name _____
Company _____
Street _____
City _____ State _____

2,161,507

FUEL FEEDING DEVICE FOR INTERNAL COMBUSTION ENGINES

Fritz Egersdorfer, Berlin Germany
Application September 4, 1937, Serial No. 162,430

In Germany September 26, 1932
2 Claims. (Cl. 137-153)



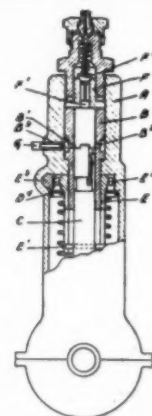
1. In a fuel-feeding device for internal-combustion engines, fuel-distributing means including a cylindrical valve chest, a valve in the form of a cylindrical shell rotatable within and longitudinally adjustable within the valve chest, the valve chest being ported with a plurality of elongated slots arranged in circumferential successagated slot, the slot in the valve being angularly disposed with relation to the slots in the chest, whereby as the valve rotates the area of coincidence of the two cooperating slots advances longitudinally of the slots, and means for shifting the valve longitudinally within the valve chest.

2,159,177

FUEL INJECTION PUMP FOR INTERNAL COMBUSTION ENGINES

Harry Ralph Ricardo, London, England
Application May 17, 1937, Serial No. 143,215

In Great Britain May 19, 1936
5 Claims. (Cl. 123-139)



1. A fuel injection pump for internal combustion engines comprising a cylinder having a suction port in its cylindrical wall, and a pump plunger adapted to reciprocate within said cylinder and to control the suction port, so that the injection period begins when the end of the plunger during its delivery stroke moves over the suction port, said plunger being rotatable about its longitudinal axis within said cylinder and being provided at its end with an end face in a plane normal to the axis of the plunger, from which end face projects an extension bounded laterally in part by at least one arcuate surface constituting part of the cylindrical surface of the plunger, said arcuate surface terminating laterally in at least one edge which is parallel to the longitudinal axis of the plunger.

2,159,236

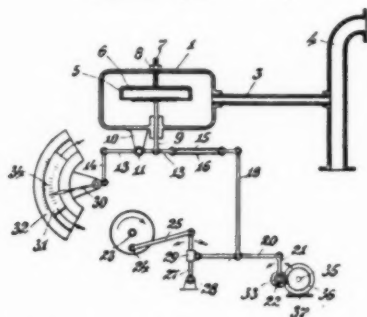
DEVICE FOR CONTINUOUSLY REGISTERING THE REVOLUTIONS OF AN INTERNAL COMBUSTION ENGINE IN CONSIDERATION OF THE ACTUAL LOAD

Edmond Uher, Munich, Germany, assignor to the firm P A G Patentgesellschaft A. G., Zürich, Switzerland

Application October 29, 1936, Serial No. 108,164

In Germany November 4, 1935

6 Claims. (Cl. 73-187)



3. A registering device for indicating the total load taken upon by a combustion engine during its running period, said device comprising a register, a crank arm driven by the crank shaft of the engine, a swinging lever actuated by said crank arm, a slidable collar adjustable on said lever, (a swinging arm intermittently actuating said register, a bar connecting said sliding collar with said swinging arm, a pressure chamber connected to and subject to the pressure in the intake pipe of the engine, a pressure box within such pressure chamber a diaphragm forming the bottom of said pressure box, a spindle fixed to said diaphragm and projecting downwardly through the bottom of said pressure chamber, a double armed lever pivotally arranged below said pressure chamber, one arm of said lever being pivotally connected to said bar and said spindle and including a bi-metal bar, an adjustable scale, and a pointer moving over said scale, said pointer being driven by the second arm of said two-armed lever.

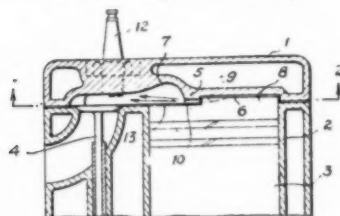
2,161,244

INTERNAL COMBUSTION ENGINE CHAMBER

James P. Burke, Knoxville, Tenn., assignor of one-half to F. L. McLaughlin, Detroit, Mich.

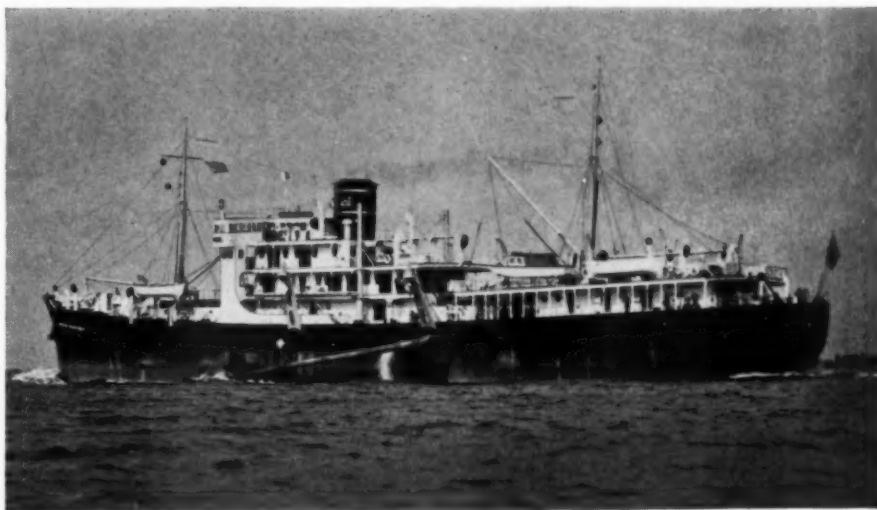
Application March 16, 1938, Serial No. 196,102

8 Claims. (Cl. 123-191)



1. A head for the cylinder of an engine, said head having a combustion chamber with a transverse wall depending from the roof thereof directly above the cylinder, and dividing the combustion chamber into two compartments, one of said compartments being heart shaped in bottom plan view with its tip being nearest the other of said compartments, the other of said compartments having the shape of the sector of a circle in bottom plan view, said transverse wall being cut away from the tip of the heart to the interior of said sector to form a restricted passageway between said compartments.

on the CHESTER HARDING



it's *Electrical* R. P. M. Indication in both engine room and pilot house

WESTON Electrical Tachometers are used to indicate the R.P.M. of both propulsion engines, as well as the generating engine, on the "Chester Harding." Indicators for the three engines are mounted on the central engine control panel. However, duplicate indicators for the propulsion engines also are mounted in the pilot house.

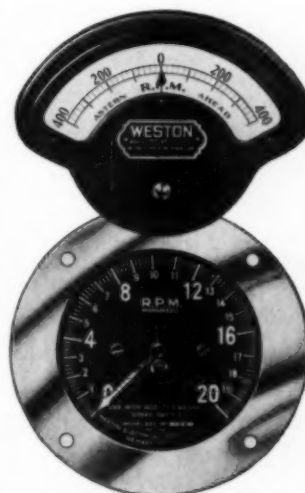
For huge dredges like the "Chester Harding," as well as for the smaller Diesel vessel, the Electrical Tachometer exactly meets every need:

Neither distances nor obstructions present any installation difficulty. Just run a simple wiring connection from the engine mounted magneto to the indicator... regardless of distances or sharp turns.

Constant, 24 hour operation presents no maintenance problem. With no shafts, no troublesome wearing parts, operation is virtually trouble-free.

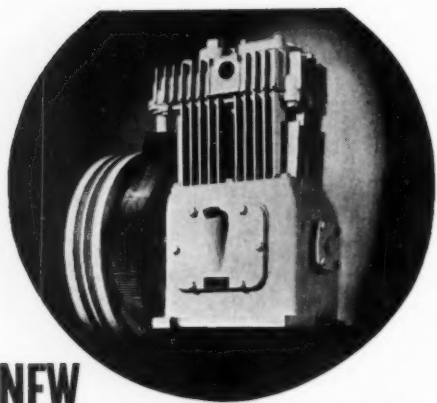
For efficient operation, duplicate indicators are essential. Simply wire the required number of indicators to the one magneto, and mount them wherever required.

And there are other features, too, which make the electrical tachometer more practical, more economical, for marine requirements. Let us send you all the facts. Write to... Weston Electrical Instrument Corporation, 579 Frelinghuysen Ave., Newark, N. J.



WESTON Indicators are available in various sizes and shapes, with scales calibrated in any range of R.P.M.

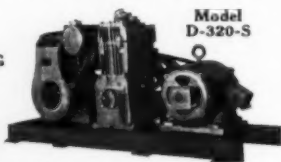
WESTON ELECTRICAL TACHOMETERS



NEW FOR DIESEL STARTING

THESE new Quincys not only look more business-like—but, design and construction are greatly simplified. Patented **LOADLESS STARTING** feature assures added dependability. Lubrication more thorough—more positive. Radiation area 12% greater. Dustproof crankcase. Quieter. More efficient. All types mountings. Pressures up to 500 lbs. per sq. in. **QUINCY COMPRESSOR CO.**, Dept. 939, QUINCY, ILL. Branch Offices: New York, Chicago, San Francisco.

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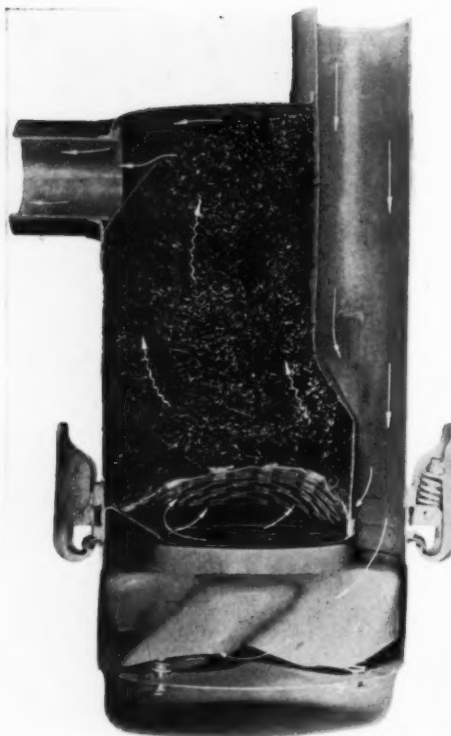
GENERATORS
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are good Diesel
insurance

ELLIOTT COMPANY
Electric Power Dept., RIDGWAY, PA.

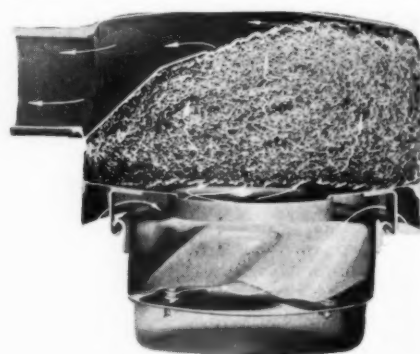
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A NEW OIL BATH AIR CLEANER



Type R.



Type S.

A MODERN design of an oil bath air cleaner for small and medium sized equipment. This latest air cleaner of the Vortex Manufacturing Company is made in two types, the Type R and the Type S.

The air, made to whirl rapidly as it enters the cleaner, produces a vortex action picking up oil from the oil reservoir, spraying it on the impingement surfaces of the vortex chamber, and into the filter element, thoroughly washing it

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waste!



**DIESEL
LUBRICANTS**

• Efficient Diesel operation, freedom from breakdowns and tie-ups demand efficient lubrication. Only lubricants that stand up—lubricants engineered to the job—can give efficient lubrication.

Cities Service Diesel lubricants are service proved. They have been tested—proved by years of service—to be lubricants that give outstanding service.

The Cities Service Lubrication Engineers have a wealth of experience in prescribing and checking results in the Diesel lubrication field. You can draw on this background, this experience, to answer your lubrication problems. The Lubrication Engineers' Service is free.

A new booklet, "Diesel Engine Lubrication," is now on the press. Write for your free copy today.

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of dust. Thus, air entering a Vortex Air Cleaner is first subjected to the efficient cleaning action of a vigorous oil spray and a strong centrifugal action before it can enter the filter for final cleaning. Oil drains from the filter element carrying the small amount of dust entrapped there down into the oil reservoir.

The air inlets of these two new type cleaners are submerged in oil, thereby greatly increasing the vortex action at low air flows. *Oil is carried into the filter element by the first revolutions of the engine.*

The principal difference between the Type R and Type S cleaners is that the Type R takes air in through a vertical inlet stack while the Type S admits air over the edge of the cup. Under conditions where it is desirable to extend the inlet of the air cleaner to reduce the dust load or where chaff or fibrous materials are encountered, the Type R is recommended. An exclusive feature of the Type R is a removable prefilter at the entrance to the filter element. This prefilter stops chaff, fibers, etc., and is easily cleaned. For general operating conditions, the Type S should be specified. Its wide range of operation at very high efficiencies makes it extremely valuable to the manufacturer in reducing the number of models of cleaners required to adequately protect his line of equipment.

In addition to an oil bath air cleaner with a wider range of operation at high efficiencies, Vortex has provided in this new series of cleaners such paramount features as:

A quickly and easily serviced oil bath air cleaner having all parts readily accessible for cleaning.

A compact air cleaner easily installed. Note especially the Type S with its short body.

DONALDSON FIRM WINS PATENT SUIT

DONALDSON CO., INC., 666 Pelham Street, St. Paul, Frank A. Donaldson, President, has just won a patent suit which is defended for a Portland, Ore., distributor of Caterpillar tractors involving an air cleaner manufactured by the Donaldson Company for the Caterpillar Tractor Company. The suit brought by Cyclone Air Cleaner Co. vs. Loggers & Contractors Equipment Co. was dismissed upon motion of attorneys for the Donaldson Company at the conclusion of the plaintiff's case on the ground that under the law and the facts plaintiffs had failed to make out a course of action. No appeal can be taken, according to Donaldson Company's attorneys.

FIRST-AID TO DIESELS!

No more break-in scuffing, scoring, seizing! On rings, pistons, cylinders, tappets, camshafts, gears—all bearing parts, a coating of

THERMOIL-GRANODINE

Maintains Lubrication
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Make a Sound
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The "Fidus" is Rejuvenated

The party fishing boat "Fidus" has taken a new lease on life, having just installed a 280 horsepower Fairbanks, Morse 4 cycle Diesel. To insure the comfort of the passengers, a Maxim Exhaust Silencer is located in the stack — positive

protection against unwelcome noise.

A new engine is not a requisite for quiet operation—but a Maxim Silencer is. Many models are available for all types of internal combustion engines, both old and new.

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DIESEL ENGINES STATIONARY—MARINE

Two Cycle Type
750 to 6500 H. P.

Four Cycle Type
600 to 1500 H. P.

NORDBERG MFG. CO.
MILWAUKEE, WIS.

★ STAR GENERATORS ★

ALTERNATORS
WITH EXCLUSIVE BUILT-IN
VOLTAGE REGULATOR
AVAILABLE IN SIZES UP TO 200 KW.

DC GENERATORS
AVAILABLE IN SIZES UP TO 150 KW.

OUR ENGINEERING DEPT. IS AT
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★ STAR ELECTRIC MOTOR CO. ★
BLOOMFIELD, N. J.

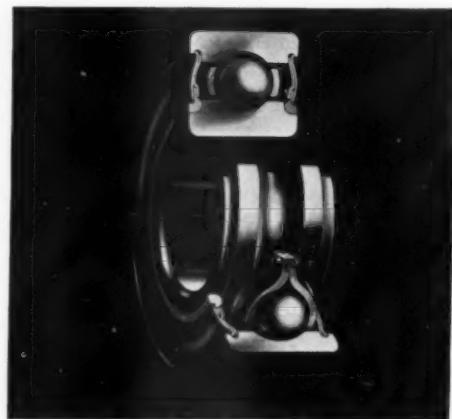
SKF PRODUCES A DOUBLE FELT SEAL BEARING TO SINGLE ROW WIDTHS

A LINE of sealed ball bearings along entirely new and simple principles has just been developed by SKF Industries, Inc., Philadelphia. The seal used in these bearings is one that can be applied to bearings having a standard single row S.A.E. dimension of bore, inner and outer race width, which up to the present time has not been possible except through the use of small balls and, consequently, loss of bearing capacity.

This outstanding development has been evolved by departing from the conventional stuffing box type of seal in favor of modern air-cleaner principles sealing against dirt by the felt fibre contact on the polished surfaces of the inner race, and by the utilization of the natural tendency of deflected felt to resume its original flat shape.

Extensive tests have proved that the new seal retains the bearing lubricant and excludes any dust or dirt entry into the bearing itself, yet the sealing action is so light that the friction drag has been greatly reduced.

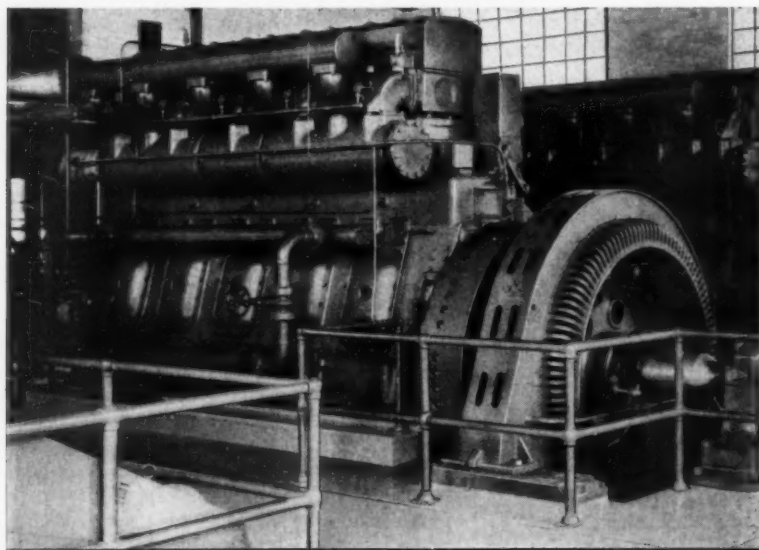
The bearing is, therefore, suitable over a great range of speed. Even though the bearing is in the standard single row width, which in itself



simplifies design and saves space, an ample lubricant space is provided as is indicated in the photograph. It is called The SKF Red Seal Bearing, "the stop signal for dirt." Its designation is 6,200 RS, and it is available for shafts up to approximately 1" in diameter.

AMERICAN DIESEL TO FROST

American Diesel Engine Corp., Melrose, Mass., has named Harry M. Frost Co., Boston, as its agency. John R. O'Leary is account executive.



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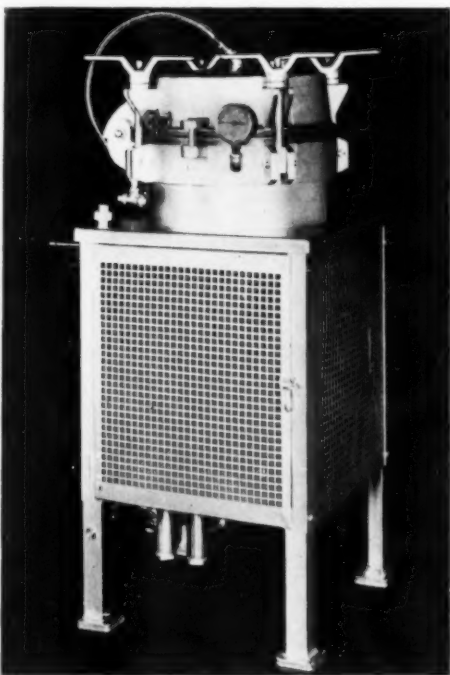


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NEW HILCO OIL RECLAIMER

THE Hilliard Corporation, 122 Fourth St., Elmira, N. Y., has recently placed into production a new model Hilco Oil Reclaimer smaller than heretofore offered. It is known as the Model "B" and has the same operating features that will be found in their larger units. This model has sufficient capacity to take care of Diesel engine installations up to 500 hp., and in some cases it will take care of larger installations. The Model "B," like the larger Hilco Oil Reclaimers, is being direct connected to the lubricating systems of Diesel engines to keep the oil pure and clean and to eliminate periodic oil changing and engine cleaning.



The Hilco is a continuous type of oil purifier, using an adsorbent clay which removes all contamination; such as acidity, carbon, sludge, abrasives, and restores favorable color. Incorporated in the equipment is also an evaporating chamber which removes fuel dilution and moisture by evaporation under vacuum. This smaller Model "B" Hilco Oil Reclaimer will enable the smaller operators to profit by the use of such equipment, just as the larger operators have been doing for some time. Dimensions of the Model "B" Hilco are 17½" x 17½" x 38" high.

More complete information on this unit is available for those who are interested, along with an interesting booklet, "Oil Reclamation," which also describes other available models.

LISTER-BLACKSTONE, INC.

Arrangements have recently been completed whereby the Diesel engines of R. A. Lister & Co., Ltd., Dursley, England, will be built in the United States by Le Roi Company of Milwaukee. Lister and Blackstone engines are available in both vertical and horizontal types in a wide range of sizes. Enquiries for large, medium, and small sized Diesel engines should be addressed to Lister-Blackstone, Inc., Milwaukee, Wisconsin, where they will receive the prompt attention of Harold E. Hill, Sales Manager.

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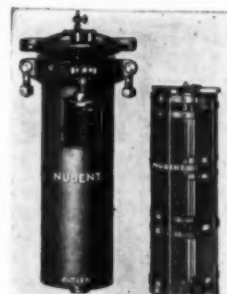


FIG. NO. 1115 HA-45

Filt. Cap. G.P.M.—8 to 36
Filt. area 2368 sq. in.
O. D. 9½"; Ht. 26"

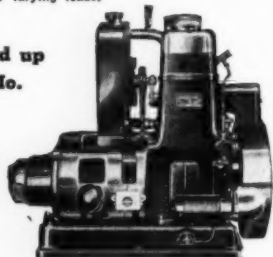
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FLUSHING, N. Y.

FLushing 9-9484 W

**SPECIAL GOVERNORS MEET BUS
OPERATOR NEEDS**

PROGRESS in safe and economical operation of buses and heavy-duty trucks is made possible by a two-speed mechanical governor, developed by the Handy Governor Division of the King-Seeley Corporation.

This new governor is conventionally set to limit top speed of the motor to 1,800 rpm. but to also permit speeds of 2,200 to 2,300 rpm. in the lower gear ratios. The speed change device is automatic and operates by cable from the transmission. An optional additional device operates a warning signal inside the vehicle whenever it is allowed to exceed a pre-determined safe speed, coasting down hill.

Installation details are complete for Greyhound, Cross-Country and A-C-F bus engines, as well as several trucks. Engineers from the vehicle manufacturers collaborated in the development.

Chief advantage of the new Handy is the added ability it confers on the bus engine for acceleration and hard pulling in lower gear ratios.

For the White 12-cylinder motor Handy is producing a governor which automatically reduces the motor speed, whenever the clutch is disengaged, thus preventing overspeeding when idle—a practice which has ruined many engines. Control of this White-Handy is worked off the air pressure in the braking system.

Delving into the problems of Diesel government, Handy engineers have developed a gov-

ernor which controls idling, as well as running speed. This new design also permits normal accelerator pedal control, relieving the Diesel operator from the need of overcoming heavy spring pressure. Another Diesel-Handy refinement, designed especially for the new Yellow-Coach buses in New York and Chicago, governs from the transmission and shifts automatically between the hydraulic and direct drives employed by these vehicles.

CARL H. VAUPEL APPOINTED

CARL H. VAUPEL was recently appointed sales manager of Diesel Equipment Corporation, Chicago, manufacturers of fuel pumps and injection systems for Diesel engines. Well



Carl H. Vaupel

known in the Diesel industry, Mr. Vaupel served 13 years with Fairbanks, Morse & Co. in various capacities in the research and engineering departments. For the past two years he has been sales manager of the Northern Pump Co.

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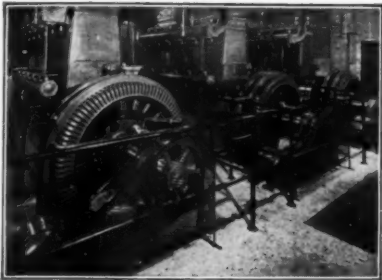
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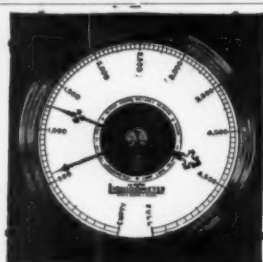


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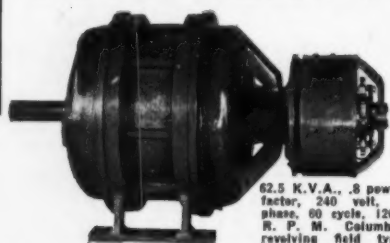
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THESE TRAINS MAKE MONEY

THE first of the American lightweight, streamlined trains went into service in 1934. About eighty of them now are operating on some twenty railroads. They were, and still are, a new development in the long and romantic story of American transportation. However, the most striking thing about them, perhaps, is the fact that every lightweight, streamlined, high speed train operating in the United States has meant additional passenger traffic and substantial earnings for the railroad placing it in service.

Certainly not so much can be said for the older type of American passenger trains. The passenger business in these United States has been sick for a long time.

The stainless steel, lightweight *Zephyrs*, moving between Chicago and Denver, showed the highest ratio of earnings for any train of the new type, for the year ending June 30, 1938. With a gross revenue of \$2,088,938 these trains earned a net of \$1,568,831. This was 75.1 per cent of the gross or \$2.07 per train mile.

The high speed streamlined *Hiawathas*, between Chicago and the Twin Cities had a gross revenue of \$1,337,898, with net earnings of \$3.22 per train mile or 4.1 per cent of the gross.

Usually the new trains show a steady increase in revenues for a considerable period after going into service. The *El Capitans*, between Chicago and Los Angeles, went into action in February, 1938. They produced \$8,000 in revenues that month; \$38,000 in March; \$49,000 in April; \$83,000 in May and \$101,000 in June. Undoubtedly the day of the old time coach service is just about over. While the new trains are not the answer to the railroad passenger problem, everywhere their showing in earnings and popularity seems to be an excellent answer to the question, "What can the railroads do to help themselves?"

FURTHER PROOF OF RELIABILITY OF AMERICAN ENGINES

MANY used engines are installed in this country and some of these have seen years of service, but we think it exemplifies particularly the reliability and sturdiness of American engines when we realize that numerous used, rebuilt machines are being shipped to far distant places.

One of our advertisers has recently put through their shop a number of oil engines which will be installed in Manchukuo for mining operations there. These engines will be in locations far removed from service shops or factory branches so that the utmost reliability must be had.



Another evidence of the confidence placed in these engines, and the firm that re-builds them, is the order received from one of the largest chain store organizations for several units shipped to Alaska to furnish power for their salmon canneries.

The shop procedure in re-conditioning these engines is interesting, and the advertiser referred to above has excellent facilities for doing this work. The engines are completely dismantled, carefully inspected, and any necessary repairs or replacements are made. The bearing replacements are made in the most modern manner, being poured centrifugally, and the resulting job is very fine.

After this thorough re-building, the complete unit is set up on the test bed, which is quickly adjusted for all sizes of engines, and run under actual load conditions, a complete test report being recorded and available to the purchaser if required.

In many cases it is found possible to interest prospective Diesel engine purchasers in rebuilt equipment where it is not economically possible, at the time, to consider new equipment.